This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

A 435192 DUPL

THIRD

ANNUAL REPORT

OF

SAPPORO

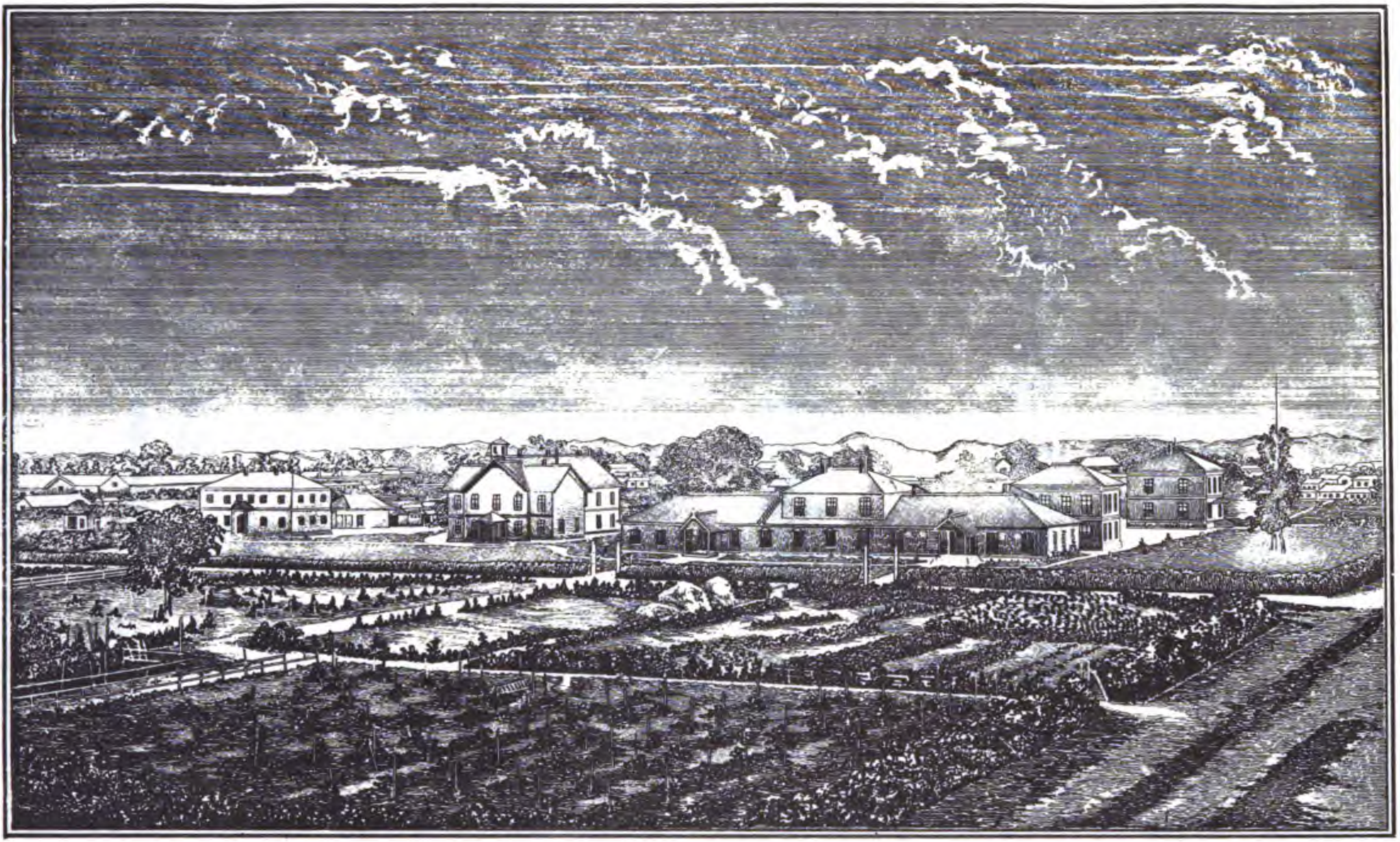
AGRICULTURAL COLLEGE,

JAPAN.

1879.

TOKEI:
PUBLISHED BY THE KAITAKUSHI.

THE UNIVERSITY OF MICHIGAN ·LIBRARIES·



SAPPORO AGRICULTURAL COLLEGE

THIRD

ANNUAL REPORT

OF

SAPPORO

AGRICULTURAL COLLEGE,

JAPAN.

1879.

TOKEI:
PUBLISHED BY THE KAITAKUSHI.

THIRD
ANNUAL REPORT
OF
SAPPORO
AGRICULTURAL COLLEGE,
JAPAN.

1879.

TOKEI:
PUBLISHED BY THE KAITAKUSHI.

Asia Library
S
539
.J3
H74
1976
v. 3a

213-487942

Sapporo, April 3rd., 1879.

His Excellency,
DZUSHIO HIROTAKE,
Kaitaku Daishiokikuwan,
Director Sapporo Ag'l. College.

Sir:—

I have the honor to transmit to the Colonial Department, through your Excellency, the Third Annual Report of Sapporo Agricultural College.

Very Respectfully,
Your obedient servant,
W$_m$. WHEELER,
President.

CONTENTS.

Page.

Changes in the Faculty, ... 1.

Additions and Improvements, ... 3.

Departmental Instruction, ... 5.

  Department of Physiology and Comparative Anatomy, 5.

  Military Department, ... 5.

  Department of Mathematics and Engineering, .. 6.

General Observations, ... 7.

Preparatory Classes, ... 10.

Report on the Botanic Department, ... 13.

Report on the Chemical Department, ... 19.

Report on the Agricultural Department, ... 31.

Report on the College Farm, ... 43.

Catalogue of Officers and Students, ... 61.

Plan of Organization, ... 70.

  Object, ... 70.

  Admission, ... 71.

  Private Cadets, ... 72.

  Forms of Application and Agreement, ... 73.

  Examinations and Rank, ... 74.

  Dismission, ... 75.

  Diplomas and Certificates, ... 76.

  Prizes, ... 76.

  Attendance and Discipline, ... 76.

  Faculty, ... 77.

  General Course of Study and Instruction, .. 78.

  Library and Reading-Room, ... 81.

  Apparatus, Cabinets, Collections, etc. .. .. 83.

  Calendar, ... 84.

  Preparatory Department, ... 85.

Preparatory Course of Instructions, ... 86.
Abstract of Final Examination Exercises, ... 89.
Rank Lists. .. .. 109.
Award of Kaitakushi Prizes, ... 114.
Special Prizes, ... 115.
Additions to the Library, ... 117.
Library Books Destroyed by fire, ... 129.
Reading Room Files, ... 131.
Presented, ... 132.
Summary of Meteorological Observations for 1878. 133.

ANNUAL REPORT.

His Excellency,

KURODA KIYOTAKA,

Minister of the Colonial Department,

Empire of Japan.

Sir :—I have the honor herewith to present to Your Excellency the Third Annual Report of Sapporo Agricultural College, with accompanying papers.

The growth and work of this institution during the past year, which are briefly reviewed in the following pages, present encouraging indications of continued success and promise.

CHANGES IN THE FACULTY.

The admission of the third class of freshmen at the opening of the present academic year,—increasing the whole number of students to the prescribed complement of fifty,—together with the gradual attainment of the classes to more advanced instruction, necessitated the employment of a professor for the chair of Physiology and Comparative Anatomy who should be also professor of English Literature ; of a native instructor for the Military department ; and of one assistant instructor in each of the Mathematical and Chemical departments who should also be teachers in the Preparatory School.

For the former place the Colonial Department was fortunate in securing the services of J. C. Cutter, M. D. Dr. Cutter is a graduate of Massachusetts Agricultural College and of Harvard Medical School, and was House Surgeon at Boston City Hospital during eighteen months by virtue of his superior rank in the Medical School. In conjunction with his college appointment, he was made Consulting Physician to the government hospital at Sapporo.

Mr. Miyasaki Michimasa, assistant instructor in Chemistry and teacher in the Preparatory School, was graduated at the Tokio University in 1877. Mr. Ichigo Hiroyoshi was appointed assistant instructor in Mathematics and teacher in the Preparatory Department.

Application was made to the War Department for the nomination of an officer of the Japanese army for instructor in Military Tactics, to which position Lieutenant Kato Shigeto was recommended and duly appointed.

The frequent solicitations of the Colonial Department, for engineering services, to which, from the first of my employment, I had been subject,—though formerly acceded to in a large measure,—I have been compelled during the past year to decline, in the face of my enlarged duty in behalf of the College. In accordance therefore with a proposition of Your Excellency and the Director of the College, my appointment to the additional office of Civil Engineer to the Department was determined upon, and Mr. C. H. Peabody was immediately engaged to take active charge of the department of Mathematics and Civil Engineering.

Prof. Peabody, beside receiving three years instruction in Massachusetts Agricultural College, was graduated at Massachusetts Institute of Technology in the department of Mechanical Engineering.

ADDITIONS AND IMPROVEMENTS.

Military Hall building,—completed during the season of 1878,—was dedicated on the sixteenth of October with appropriate exercises, in which His Excellency, the Colonial Minister, and the Director of the College engaged. The building affords a drill hall and armory for the Military department, exhibition and work rooms for the College Museum, and two lecture rooms. A tower clock has been ordered from America for this building, to furnish standard time for the whole city.

The only building now to be erected is a small Astronomical Observatory, plans for which have been approved and are now in process of execution. This Observatory is of octagonal plan, twelve feet in diameter, with a revolving dome, and is entered through an enclosed porch. It is intended for instruction in the simpler astronomical observations, and in the determination of latitude, longitude, time, etc.

The buildings erected, and improvements made upon the College Farm are duly mentioned in the report of its Director,—Professor Brooks,—transmitted herewith.

During a leave of absence extending from March 27th to September 11th last, I was authorized to procure for the College,—beside live-stock, machinery and implements for the Farm and Botanic Garden,—the following apparatus, instruments, models, and books:—

For the Mathematical and Engineering department, a complete outfit of physical apparatus; a collection of engineering, mechanical, and agricultural machine models; and an azimuth and altitude instrument, adapted also for accurate triangulation.

For the Chemical department, a superior spectroscope with accessories, and a quantity of apparatus and chemicals.

For the Library a large number of important text-books, and several standard periodicals for the reading-room.

Of the apparatus purchased, a considerable portion is still to arrive.

The College has been fortunate in securing a fine microscope and objectives, by Tolles, with a large number of valuable object slides and all the important accessories for advanced microscopic study and instruction,—being the outfit collected by Professor Penhallow for his private use.

The Military department has been organized during the past year, and rifles and side arms for a battalion of fifty men provided.

The additions to the Library, comprising six hundred and fifty volumes, together with a list of books destroyed by fire at the burning of the Kiu Honjin are appended hereto. The books of the Library have been arranged in classes, according to the subjects treated of therein, and for the further convenience of takers and the librarian, it is now recommended that a carefully constructed catalogue be prepared for publication.

The Reading-Room has been liberally supplied with about thirty of the best publications of their class, comprising twenty five foreign and five native periodicals. Of these about one-half are contributed by friends of the College. A list is appended.

Although no degree of care in the provision of the present can be relied upon to satisfy all future requirements in any progressive work or period, we may say that during the past year the material needs of the College for carrying out the routine of study and training prescribed under the present system have been, in the main, provided for. The institution has passed the formative stage, and is now possessed of all the important requisites for its legitimate work.

DEPARTMENTAL INSTRUCTION.

The condition and progress of the several departments of instruction may be gleaned in some measure from the accompanying Rank Lists, and Abstracts of Examination Exercises.

The methods pursued and the practical work accomplished in the departments of Chemistry, Botany, and Agriculture are presented in the appended reports of Professors Penhallow and Brooks.

DEPARTMENT OF PHYSIOLOGY AND COMPARATIVE ANATOMY.

The department of Physiology and Comparative Anatomy, and that of English Language and Literature have now assumed their proper place and are given due prominence under the direction of Professor Cutter who entered upon his duties September 23rd last. Instruction in veterinary science and practice will be given by him, and his report with contributions of practical observations and statistical information are promised for the next Annual Report.

MILITARY DEPARTMENT.

Lieut. Kato arrived at Sapporo in season to begin Military instruction on the twenty-ninth of November last. For the present the whole attention of the department will be devoted to instruction in the infantry arm of the service, upon the system which has been modelled after the French for the Imperial Japanese Army.

DEPARTMENT OF MATHEMATICS AND ENGINEERING.

In the Mathematical and Engineering department the two lower classes have received the instruction prescribed for them upon the general system marked out for their predecessors, referred to in the last Annual Report.

The work of the department was temporarily disturbed through my absence in America during three and one-half months of term time, but by suitable changes in the arrangement of studies, the work has been brought to its proper stage. The Freshman class were unavoidably deprived of three weeks of mathematical study at the beginning of their first term, and were subject to a change of instructors on the arrival of Mr. Ichigo, November 8th, who taught during the remainder of the session. With this single exception all the classes in all the academic departments have received their instruction directly from the professor in charge.

The lectures given upon the theory of surveying during the second term of Sophomore year, were supplemented by practical field exercises during the first term of Junior year, in conjunction with the computations, mapping, and other office work incident thereto. For this purpose the class was divided into parties of seven men, to each of whom was first assigned a position in his party according to the rank attained by him in the lectures already given. At the end of each successive week the chiefs of party were reduced to the lowest position, and all others promoted one step. Each chief of party was held responsible for the methods used, the accuracy attained, and the discipline maintained under his leadership,—the professor in charge directing simply what work should be done and giving all necessary advice and assistance as to the various methods of doing it.

Instruction in topographical surveying and levelling was conducted in like manner. Toward the close of the term the class was organized into two parties, to whom was assigned the voluntary work of completing the topographical survey of the College Farm, and the construction of a map thereof for publication in the Annual Report. When about two-thirds done, however, the work was interrupted by the abundance of the snow, rendering it impossible to present the result with this Report.

The studies of the Junior class in astronomy during the last term were devoted chiefly to the mechanism of the Solar System, including the solution of problems on latitude, longitude, time, planetary revolutions, and the distances, volumes, masses and densities of the bodies of the solar system.

The purchase of a small astronomical instrument, and the completion of the Observatory now building, will prove valuable aids to the practical instruction of future classes.

The arrival of Professor Peabody on the thirteenth of January last, enabled him to enter upon his work with the opening of the present term. Since then he has attended to the entire work of instruction in this department, with the exception of mechanics, which however was also consigned to his charge upon my confirmation as Civil Engineer to the Department.

GENERAL OBSERVATIONS.

The general course of study and training has been slightly modified in a few minor details. Practical instruction in Spectrum Analysis is provided for during one-half the second term of Sophomore year in the Chemical department.

The time devoted to Zoology during the first term of Junior year is increased from three to six hours per week, and that given to English Composition and Elocution reduced from four hours to one hour weekly. In the second term of Junior year, Practical Horticulture is substituted for Landscape Gardening.

During the first term of Senior year, Practical Exercises in Farm Management will be introduced, Veterinary Science and Practice transferred from the first to the second term, and Mental Science and Logic,—substituted for Mental and Moral Philosophy, —brought from the second into the first term of Senior year.

The close of the second academic year of the College, July 3sd last, was observed by a public exhibition consisting of the following exercises :—

Sophomores : Salutation and Japanese oration on "Agriculture and its Development," by S. Sato; English oration, "Science the Handmaid of Religion," M. Oshima ; Select declamation by K. Uchida ; English oration on " Self Dependence," T. Watase.

Freshmen : Japanese oration, "We should have no Antipathy against Russia," by R. Uchimura; English oration on " The Influence of Agriculture upon the Morals of Those Who Engage in it," I. Ota ; Select declamation by K. Ito ; English oration, " Fame Preferable to Riches," Y. Iwasaki.

Award of Kaitakushi Prizes, and address by the Director of the College.

The sanitary condition of the College during the past year has, in the main, continued to be excellent. One exception only, characteristic of so-called " new " countries,—may be noticed in the fact that every member of the College connected with Professor Penhallow's expedition up the valley of the Ishikari river and some of its unexplored tributaries during the summer of 1877, was attacked with ague in the following season.

The prevalence of myopy or shortsightedness, among the students to a very noticeable extent, led me to make simple examinations for the determination of the extent of this malady. Test letters of certain standard dimensions adopted for this purpose were used, which, with unimpaired vision may be readily distinguished at a distance of twenty feet. The results, in tabular form, are stated thus:

Class of	Examined.	Number of Students at distance of					Totals.
		20 ft.	15 ft.	10 ft.	5 ft.	2 ft.	
1880	Dec. '77	7	7	1	—	—	15
1881	Dec. '77	8	5	2	3	—	18
1882	Apr. '79	2	5	3	5	2	17
Totals.		17	17	6	8	2	50

Whence it will be perceived that while the average distance at which the letters could be distinguished was fourteen feet, not less than sixty-six per cent. of the students failed to stand the test for perfect vision.

Undoubtedly the fumes and noxious gases from open charcoal fires, and the inferior artificial illumination which the inmates of most Japanese houses are compelled to suffer, are potent causes of defective sight and disease of the eyes in this country.

The students of the College have established a journal bearing the title of "*Sapporo No Gakko Ho Koku Sho*,"—a monthly bulletin devoted to the general interests of the institution, and to the dissemination of agricultural and scientific information. The editors are elected by the students, and the paper is printed under the patronage of the College at the local government printing office.

THE PREPARATORY CLASSES.

The only promotions made in the Preparatory School at the close of the last academic year consisted in the admission of the members of the first class to the present Freshman class. The pupils of the second and third classes, having been received into the school regardless of the qualifications since prescribed therefor, are to be continued during the present year at the same nominal grade in order to raise the standard of instruction to that contemplated in the regular course of study.

Since the beginning of the current school year, instruction in this department has been conducted wholly by Japanese teachers,—the duties of professors requiring their full attention within their own departments.

It must be observed in this connection that "the action of Your Excellency approving the employment of a competent American" as "master of that department,"—to which I pointed in my last report as promising relief under an imperative necessity,—has thus far failed of execution. While I am heartily of opinion that it should be the policy of the government to employ no foreigners for any work for which natives equally capable are to be found, and that foreign employés should be invariably dispensed with as promptly as Japanese can be qualified and substituted therefor, I am assured that I run counter to neither the opinions nor prejudices of either my native or foreign colleagues in declaring that so long as a collegiate course of training is to be here administered solely by foreign teachers, some previous contact with a foreign instructor is essential to the adequate preparation of pupils therefor. The fact, that without such opportunity, no student has yet gained admission to this, or to any other institution of equal grade in Japan, lends weight to this conclusion. Few teachers of conversation in a foreign tongue, who have not lived in close contact with those whose native language they teach, can avoid using their own, even though it may be to the detriment of the work they are called to do.

It is therefore important that, if the Preparatory School is to be sustained, a foreign principal be secured therefor.

Among the distinguished visitors at the College during the last session, who formally examined its work and methods, were His Excellency General Kuroda, Minister of the Colonial Department; His Excellency Admiral Kawamura, Minister of the Navy; Vice Admiral Enomotto, His Majesty's Minister to Russia; Mr. Youchi, Director of the Colonial Farms at Nanaye, and others. The late nobles of Japan, Messrs Inada, Date, and Katakura, were also formally received, and a public entertainment in their honor was given at Military Hall.

In submitting to Your Excellency this review of the work and progress of another year, I beg leave to acknowledge in behalf of the College, the liberality with which the government has wisely sought to promote its various interests, in tacit recognition of the high importance of education as a primary step toward modern civilization, and to commend it to the continued wisdom and favor of the Colonial Department.

Very Respectfully,

Your Excellency's Obedient Servant,

Wm. WHEELER,

President.

Sapporo, Japan,

April 3rd. 1879.

REPORT

ON THE

BOTANIC DEPARTMENT

PROF. D. P. PENHALLOW, B. S.

PRESIDENT Wm. Wheeller.

Sir:

I have the honor to submit the following report:— During the past year, attention was chiefly directed to the work of preparation for actual instruction.

For lecture room purposes, there were prepared several series of colored charts on cloth, illustrating both Physiological and Structural Botany. The instruction given thus far, has involved the use of Gray's Manual as a general basis, though this has been supplemented by lectures and the study of specimens, as a preparation for the more practical work to follow in the spring and summer, when the students will go into the field and study plants in their relations to each other and their value to man.

To provide for the proper practical study of Botany and Horticulture, a small plant house has been provided, adjoining which are about four acres of land. This has been so laid out as to provide for the proper cultivation of a great variety of land and water plants, including wild species gathered from the surrounding country: Part of the grounds contain a sufficient number of small fruits for illustrating the general methods of Horticulture.

The grounds immediately surrounding the College buildings, have been reserved for use as an arboretum. A large number of native trees and shrubs have been collected and will be properly arranged in the grounds the coming season. There will also be introduced, such species of American trees as will prove of value in Hokkaido for timber and other purposes.

A large number of indigenous plants were sent to America to be properly identified, and have been returned correctly named.

Appended will be found a list of the Lichens common to the vicinity of Sapporo. They were identified by Prof. Tuckerman of Amberst, Mass., who discovered among them one or two new species which he named—one in honor of the finder, Pres^{t} W. S. Clark.

Much work has been done by several of the students in collecting specimens for the museum, and it was found that the prizes offered last year for the best collections, produced a generous rivalry and resulted in much good.

It has been the aim thus far, to give to such students as desire it, special work which is not provided for by the regular course of instruction.

Acting upon this plan, one student occupied his vacation in the preparation of specimens for study with the microscope, and his efforts resulted satisfactorily. Others have occupied their time in the preparation and arrangement of museum specimens.

LICHENS COMMON TO THE VICINITY OF SAPPORO.

Arthonia tadiosa.
Biatora cyrtilloides.
Cetraria citrina.
„ Clarkii. Tuckerman.
Collema leptaleum. Tuckerman.
„ nigrescens.
Cladonia digitata.
„ fimbriata, var. adspersa.
„ furcata.
„ Gracilis. L.
„ „ var. hybrida.
„ squamosa, var. delicata.

Endocarpon miniatum.
Graphis scripta.
Heterotheorum leucaxanthum.
„ megacarpum. (?)
„ sangninarium.
„ tuberculosum.
Lecanora pallescens.
„ subfusca. L.
„ „ var. allophana.
„ tartarica.
Leptogium myochroum.
Pamelia Japonica. Tuckerman.
„ physodes, var. vittata.
Parmelia sexatilis. L.
„ tiliacea. Hoffman.
Peltigera canina. Hoffman.
„ „ var. spuria.
Physcia aquila, var. detonsa. (?) Tuckerman.
„ obscura, var. endochrysea.
Placodium aurantiacum.
Ramalina calicaris, var. fraxinea.
„ „ var. fastigiata.
„ canaliculata.
„ pulsilla, var. geniculata.
Stereocaulon tomentosum.
Sticta crocata.
„ glomerulifera.
„ Wrightii. Tuckerman.
Usnea cavernosa.
„ longissima.

REPORT

ON THE

CHEMICAL DEPARTMENT.

PROF. D. P. PENHALLOW, B. S.

President Wm. Wheeler.

Sir :

I have the honor to submit the following report:— During the past year the efficiency of the department has been considerably increased, both for instruction and analytical work, by the acquisition of apparatus for advanced work, among which may be noted a fine compound spectroscope with all the essential accessories.

The instruction in practical work, covered sufficient ground to make the students well acquainted with the detection of elements and compounds by both blowpipe and humid methods, and give them an introduction to the general quantitative methods at the close of the course.

Instruction in blowpipe analysis occupies twevle weeks. The students observe the various reactions of known substances, and are required to carefully record all observations. Upon these, examinations are held.

After thus noting the characteristic reactions of the principal elements, unknown substances are given—first simple, then compound—and the student is required to prove the presence of each constituent.

At the close of the term, the student's knowledge of the subject is tested by a written examination, supplemented by the analysis of a compound which must be treated according to the methods employed during the term.

A similar course is pursued in humid analysis, and after the principal elements and their compounds have been thus studied, effort is directed toward making the student familiar with the composition of minerals, fertilizers, and other substances which a practical man would have frequent occasion to deal with.

The theoretical instruction has been given largely in the form of lectures, though a text-book has been adhered to as giving a convenient general arrangement for the student, of the subjects under consideration.

A disposition has been manifested by several of the students to engage in work beyond that provided for by the regular course, and for such as show proper qualifications, advanced work is provided whenever not in conflict with other duties.

In addition to the regular work of instruction, considerable attention has been given to various industrial operations,—among which may be noted the refining of fish oil—and to analytical work, to some of which it may be proper to refer rather more in detail.

FISH GUANO.

The fish guano as manufactured by the present methods, is always sold in a very course mechanical condition.

The fish often lie in large heaps until decomposition is induced, whereby the value of the guano is likely to be greatly reduced. They are then boiled and pressed, the cake being dried in the open air. No subsequent attempt is made to reduce the guano to a fine state of division, but it is thrown into the market in the very coarse condition in which it comes from the drying mats. Its use in such a crude form, entails more or less loss upon the farmer, from the slowness with which it acts; while if it were brought into a finely divided state and all the bones thoroughly reduced, the action would be prompt and reduce loss to the minimum.

The guano made at Otarunai, consists of herrings and is very coarse. That made at Mombets on the east coast, appears to consist of several kinds of small fish, chiefly those known to the Japanese as " Iwashi " (sardine), and in consequence is not so coarse as that made from herrings, though altogether too much so.

Analysis shows them to contain :—

In 100 Parts.

	Otarunai	Mombets.
Moisture @ 100° C	12.28	12.17
Nitrogen (total)	9.13	10.10
Phosphoric oxide (total)	3.07	3.37

K. Ono. Analyst.

SUGAR BEETS.

The experiments with sugar beets were continued during the past summer, and gave more satisfactory results than those obtained the previous year.

Seeds of good quality were obtained from both Europe and America, and planted in separate plots, each one of which received a manure different from that applied to the others, and compounded of various commercial salts or consisting of fish guano alone.

Analyses were also made of beets from special plots at different times near the close of the growing season, to determine the difference if any, in the sugar percentage. Of the thirty different analyses made, the results fortunately preserved, * are as follows ;—

For the sake of comparison, the analytical results obtained the previous summer (1877) will be introduced and are as follows ;—

---

* Nearly all the results of analysis as well as other notes, were destroyed by fire, hence it is impossible to give much more than a general statement of the results obtained, together with those notes fortunately preserved.

White Imperial (?)

Specific Gravity of Juice @ 15,5° C.	1.035
Sugar in Juice No. 1,	5.952 %
„ „ „ No. 2,	5.952 %
Moisture @ 100° C.	91.395 %

The seed was purchased and planted as White Imperial, but proved to be mixed and of poor quality. The roots were very large, and grown upon a soil only a few years under cultivation and containing a large amount of organic matter. The manure was fish guano.

As stated in the Report for 1877-78, these results can be considered of no special value upon which to base an opinion as to the adaptability of the Sapporo soil and climate to the successful culture of sugar beets.

Of the probable causes of the low sugar percentage, there were cited the poor quality of the seed; early harvesting—not allowing sufficient time for the sugar to perfect; the peculiar character of the climate—inducing excessive growth; and the character of the soil, though a decided opinion upon this was not ventured in the absence of a proper analysis.

The following results, obtained during the summer of 1878, show to some extent how far these opinions were correct. The three kinds of beets were grown in adjoining plots, and all treated in as nearly the same manner as possible. The manure was fish guano.

By analysis they gave ;—

German Seed. Sept. 18th. 1878

In 100 Parts.	Electoral	Vilmorin.
Average Weight	1.62 lbs.	1.50 lbs.
Sp. gr. of Juice @ 15.5° C.	1.035	1.040
Moisture @ 100° C.	91.603 %	90.970 %
Sugar in Juice	5.880 %	8.330 %

American Seed. Sept. 23rd. 1878.

	Wt. Imperial	Vilmorin.
Average Weight	1.62 lbs.	1.68 lbs.
Sp. gr. of Juice @ 15.5° C.	1.030	1.045
Moisture @ 100° C.	92.31 %	88.72 %
Sugar in Juice.	5.000 %	10,000 %

German Seed[1] Oct. 9th. 1878.

	Electoral	Vilmorin	Wt. Imperial.
Sp. gr. of Juice @ 15.5° C.	1.050	1.052	1.052
Moisture @ 100° C.	88.360 %	85.550 %	91.040 %
Sugar in Juice.	8.830 %	8.060 %	9.360 %

[1] *Same as of Sept. 18th.*

American Seed[2] Oct. 21st. 1878.

	Wt. Imperial	Vilmorin.
Sp. gr. of Juice @ 15,5° C.	1.042	1.070
Moisture @ 100° C.	83.160 %	82.900 %
Sugar in Juice.	6.250 %	11.760 %

[2] *Same as of Sept. 23rd.*

From these, it will be seen that there is a decided increase in sugar percentage from Sept. 18th. & 23rd. to Oct. 9th. & 21st., showing that the beets tested the previous year, were gathered too early to obtain the full amount of sugar they were capable of producing.

As all the above analyses are of beets treated wholly with nitrogenous manure, they could not be expected to exhibit so good results as are attainable by the use of other manures.

The beets from plots treated with both nitrogenous manures and commercial salts, also from those treated with the latter alone, exhibited the highest percentage, in one case giving somewhat over thirteen per cent. in the juice. In nearly every case, the Vilmorin from American seed gave the highest percentage.

An analysis of the soil, * showed it to contain about 12 % of organic matter; i. e. of the soil dried at 100° C. Both iron and alumina are present in large quantities, lime in very small proportion. The amount of potash is less than one-half of one per cent., about 0.300 %.

While a decrease in the organic matter present, would undoubtedly render the soil better adapted to the culture of beets, the experiments of this year show that, the judicious use of commercial salts such as those of potash, would aid greatly in producing more desirable results.

---

* The results were destroyed by fire, hence no accurate statement can be given.

With each year the soil is cultivated, it must become better adapted to the culture of sugar beets; but to take a large tract of new land, as must be done any where near Sapporo, and bring it into a suitable condition, would probably require several years, since we find that the land under cultivation perhaps as long as any in this vicinity, is yet far from being wholly suitable.

While the results obtained this year are promising, as showing that proper culture would probably increase the sugar percentage in a very few years, to a profitable amount, they are not sufficient to justify the belief that, sugar manufacture can be carried to a successful issue at present.

In the consideration of such an undertaking, involving, as it does, the use of special fertilizers, we must carefully consider the home resources. The manures upon which the Japanese farmer depends, are almost wholly nitrogenous. Application of such alone, will not give more than medium results. To secure the best results, it would probably be necessary to being special fertilizers from abroad, and it is a question if the farmer could afford the cost of importation.

The best results obtained the past year by the use of nitrogenous manure alone, gave 11.76 % of sugar in the juice, or 9.74 % in the whole beet. Though such might be worked with beets of higher percentage, to work them alone would be a doubtful operation.

There has lately been introduced to the notice of American farmers, a new variety of sorghum, known as the "Early Amber Cane". It has been successfully cultivated as far north as Lat. 44° 30′. A small plot was raised the past season, and its fine growth showed its adaptability to this climate.

It yields from 140 to 280 gallons of fine syrup to the acre, and each gallon is estimated to yield about six pounds of sugar, though this must vary with character of soil and treatment.

For Hokkaido, it presents some important advantages over beets, since it requires no resources other than those at hand, and its culture is similar to that of corn. The soil is already largely prepared, and good results should be obtained the first year.

SOILS.

During the past years, soils have been collected from various parts of the island for comparative analysis, and some of the results obtained are given below.

In 100 Parts Dried @ 100° C.

			Ashibets River Headwaters.	Nemuro.	Poronai.	Urashinai, Ishikari River.
Organic Matter			12.968	22.105	10.606	8.461
Insoluble Silicates			73.390	68.298	77.888	78.876
Iron	Portion soluble in dilute hydrochloric acid.	Fe_2O_3	6.377	3.436	4.601	6.796
Alumina		Al_2O_3	3.342	2.624	4.538	3.710
Lime		CaO	0.080	0.615	0.890	0.354
Magnesia		MgO	0.227	2.351	0.777	0.809
Potash		K_2O	0.181	0.008	0.135	0.899
Soda		Na_2O	0.293	0.138	0.238	0.085
Sulphuric Oxide		SO_3	traces	0.005	0.017	0.006
Phosphoric Oxide.		P_2O_5	—	traces	—	—
Chlorine			0.050	—	0.003	0.006
			99.908	99.580	99.693	99.901
Moisture in air-dried soil			25.333	22.403	19.070	32.206

Miyasaki, Analyst.

These results are stated for future reference and are only considered as closely approximate.

The Ashibets soil is a rather fine sandy loam. The sample was collected from a small level tract about seventy-five feet above the river bed, and an elevation of 2200 feet above tide water. The vegetation consists chiefly of coarse grasses and sedges. The location is such, however, and the available area so small, that the land would be of no worth for agricultural operations.

The Poronai soil was taken from a level tract in the Ikushibets valley, at the mouth of the Poronai river. From this point, the valley narrows rapidly until it strikes the mountains proper a few miles beyond. Toward the Ishikari river, the area of available land constantly increases and becomes quite extensive. The soil is a fine alluvium, and though the larger portion of the land is semi-swampy, its elevation above the river bed renders good drainage possible.

The vegetation is chiefly herbaceous and luxuriant.

The large area of bottom land, presents a fine field for agricultural operations, while the numerous low foot hills which skirt the rear, could readily be made available for pasturage owing to the slight amount of bamboo.

The Urashinai soil is very similar to that from Poronai. The land is also semi-swampy but capable of through drainage. The vegetation is luxuriant, and includes a heavy growth of timber as well as a dense herbaceous growth.

Both of these latter soils, are really samples of the same formation, and were taken from localities between twenty and thirty miles apart.

The soil from Nemuro, was accompanied by no description.

* * *

REPORT

ON THE

AGRICULTURAL DEPARTMENT.

PROF. W. P. BROOKS, B. S.

President Wm. Wheeler.

Sir :—

I have the honor to submit my second annual report as professor of agriculture.

During the past year the general course of instruction followed has been the same as that outlined in my first report; and I have also given instruction to one class during a single term in fruit culture, using a text-book. The result of my experience with a text-book confirms me in my belief that in my department, at least, instruction by lectures is the better method.

I find no book on the subjects I wish to treat that are not much too diffuse. All include too many details, too much irrelevant matter, too much speculation; and my classes cannot grasp the important ideas from such books without the expenditure of more time than is necessary in the case of lectures.

The interest of the students in their study has been unfailing, and their care and attention all that could be wished; and, except in a few cases where the knowledge of English attained by the student before his connection with the college has been insufficient, the progress made has been good.

The practical exercises have been made to cover as wide a field as possible; and have included the planting, cultivation and harvesting of many farm and garden crops, the care of stock, driving teams and the cutting of wood and clearing up of land.

In this work the students have been uniformly faithful, industrious and ambitious. So well do they devote themselves to business that, though they are paid double the price received by the ordinary laborer, their labor is the cheapest employed upon the farm.

In the last term of Sophomore year and the first term of Junior year, the members of a class are allowed to work independently at such hours as they choose, each cultivating about one-fifth of an acre of land, the object of the work of each being to carry out an experiment designed to answer some question pertaining to agriculture which I have previously proposed.

Accordingly last February a question was given to each member of the present Junior class with the request that each write a full account of a method of experiment which he thought would answer it or, at least, furnish the first step toward an answer. I am well aware that a single experiment on a small scale cannot, in one year, give results which should be regarded as decisive; and this truth I endeavored to impress upon my students. With this understanding of the possible value of the results of accurate experiments; but not expecting to answer at once and forever the various questions put to them, the students submitted their reports of proposed methods to me. I found them, in general, exhibiting considerable thought and originality; but owing to the inexperience of the young farmers, the practical details were, in some instances, faulty. Such corrections as seemed to me necessary were made, and the reasons for them fully explained.

We were then ready for work when the proper time for planting came. Each student was allowed to do an amount of ploughing more than equal to the area of his land in a large field, it not being thought best to require each to plough his own small plot as such limited areas cannot be ploughed to good advantage. All other kinds of work necessary in each individual case were performed independently, although the students were not only allowed, but advised to exchange works among themselves. As the crops raised by the several members of the class required attention at different times, it was decided that this course would allow a more prompt and better execution of the work than the confinement of each to working only on his own plot.

All freely consulted with me as to the proper time and manner of doing work; and throughout the season I exercised a general supervision of the whole ; but to the credit of the students it should be added that my duties in this connection were very light. Illness among those students who, the previous summer, has been exposed to malarial influences during a long exploring expedition, in several cases, prevented the performance of work at the most favorable time and thus lessened the value of the results obtained. With perhaps one exception where disrelish of active exertion may have been a potent influence, there was no neglect of work without good and sufficient cause ; all were active and faithful.

The peculiarities of the piece of land selected were, in a few cases, a source of inaccuracies. A hollow running through a portion of it was so wet after a very heavy rain—about three inches—as to prevent the germination of a portion of the seed planted and later to cause the decay of many of the potatoes grown upon one plot. The previous season no such results had occurred upon the land, or it would not have been chosen.

The following is a list of questions proposed:—

What, if any, is the value of salt as a fertilizer for mangold-wurzels, and how much is it best to use ?

What is the value of ashes as a fertilizer for potatoes, and how many is it most profitable to use ?

Is there any difference in the value for planting of the grain from different portions of an ear of corn ?

What is the proper distance for planting corn ?

What is the value of herring guano as a fertilizer for beets ?

Is root-pruning of the corn plant beneficial; and, if so, what should be its degree of severity, and when should it be given?

What elements of plant-food are most wanting in the soil of the college farm?*

Which is the better for turinps and mangold-wurzels,—ridge or level culture?

Which is the better for potatoes,—ridge or level culture?

Which eyes of potatoes are most valuable for planting; and is it of any advantage to plant the unmutilated tubers, or to plant the whole tubers with a portion of the eyes cut out?

What is the relative value of wood ashes used alone and in conjunction with herring guano?

What is the value of wood ashes as a fertilizer for turnips, and what quantity is it most profitable to use; also which will give the best results, ashes or herring guano?

What is the value of herring guano as a fertilizer for corn, and what quantity can be most profitably used?

The results of each of the experiments tried are of considerable value; but some allow us to form much more decided conclusions than others; and a few of these I shall briefly describe in this report. The others, furnishing the first step towards a reliable answer to the questions asked, will be kept on record; and in connection with subsequent results may, at some future time, be published.

THE VALUE OF SALT AS A FERTILIZER FOR MANGOLD-WURZELS. The results of this experiment enable us to form very decided conclusions. The land was divided into five plots, each containing one thirty-second of an acre. Each plot received thirty-five pounds of herring guano and fifty-six pounds of ashes, both spread broadcast and harrowed in a few days before the seed was planted. The plots were lettered respectively A, B, C, D, and E.

---

* Three students experimented upon this question, the crops planted being corn and potatoes.

A received an aplication of salt at the rate of fifteen bushels per acre; B and D, at the rate of ten bushels per acre; C, at the rate of five bushele, and E, none. The treatment of each plot was in all respects, except in the application of salt, precisely similar; but on account of a low place in B, and C, some of the seed failed to germinate. The vacant places were filled; but the transplanted beets never equalled the others upon the same plots in growth, and the crop on these plots was undoubtedly somewhat less than it otherwise would have been. The number of pounds of beets raised upon the several plots was as follows;—A, 1670; B, 1497; C, 1592; D, 1920; and E, 555.

This experiment then clearly shows that salt is beneficial, since E, without salt, produced little more than one-third as large a crop as the smallest produced with salt. The difference between the plants upon E and those upon the remaining plots was more marked during their early growth than at harvest.

It will be noticed that D, furnished with salt at the rate of ten bushels per acre, produced a larger crop than A which received salt at the rate of fifteen bushels per acre. This indicates that the larger quantity, if not positively injurious, was of no use. Whether the smaller quantity applied to C. would have been sufficient to produce a maximum crop, we unfortunately cannot decide on account of the failure of a portion of the seed to germinate. This experiment will be repeated the present year.

RIDGE AND LEVEL CULTURE. The result of the experiment with potatoes was slightly in favor of ridge culture, the yield from each plot (one thirty-second of an acre) being as follows;—ridge culture, 426 pounds; level culture 385 pounds. The quality of the potatoes grown under ridge culture was better than under level culture, the number of tubers exposed to the influence of sun and rain in the latter case being quite large, while in the former there were almost none.

The results of the experiments with beets and turnips indicate that ridge culture will prove best also for these crops.

The soil upon which these experiments were tried is rather imperfectly drained, and was ploughed shallow. Upon soils thoroughly underdrained and deeply pulverized the result would undoubtedly be different; although, even under such conditions, since the climate is so humid, the ridge system of culture, as it exposes more surface and thus allows a more rapid drying and warming of the soil, may prove best. Further experiment in this direction is needed, and will be made the present season.

CORN FROM DIFFERENT PARTS OF THE EAR. The difference in the germination of the seed from the different parts of the ear was particularly noticeable. Much of the grain from either end of the ear failed to germinate, and those plants which did grow from this grain were for a long times very perceptibly weaker than the plants from kernels from the central portions of the ear. The harvest showed a difference in favour of those plots on which the grain from the centre of the ear was planted; but the exact amounts cannot be stated as the crows ate a portion of the crop. With thousands of crows as we have here, it is well-nigh impossible to obtain an exact result in experiments with corn. No value can, therefore, be attached to this experiment other than this:—that it indicates that, since the corn from the central portions of the ear makes the strongest plants and is more certain to germinate, it is good policy, when selecting seed for planting, to reject a few of the kernels from both the large and small ends of the cob.

VALUE OF DIFFERENT PARTS OF THE POTATO FOR PLANTING. In this experiment six plots of land, each containing one thirty-second of an acre, were used. On A whole tubers of medium size were planted; on B, halves of potatoes of similar size cut lengthwise; on C, those ends of potatoes, cut into halves transversely, containing the least number of eyes; on D, those ends containing the greatest number of eyes, but a portion of these eyes were cut out, the number left being the same as planted in C; on E, whole tubers with all the eyes, except the same number at the small end as planted on C and D, cut out; and on F, whole tubers with an equal number of eyes at the other end. The number of eyes planted on the last four plots in each hill was four or five.

The manuring, preparation of the soil and cultivation of the crop were alike on all the plots; but it was evident that A was naturally somewhat richer than the others. The yields in pounds were as follows:—A, 502; B, 395;* C, 415; D, 425; E, 517; F, 516.

A and B must be left out of the account as in both the result was vitiated by outside circumstances. On inspection of the yields of the other plots we see that on E and F, where whole tubers with a portion of the eyes removed were planted, the yield was, in each case, about one hundred pounds greater than on C and D, where an equal number of similarly situated eyes but only half the tubers were planted. This indicates that it is an advantage to plant the whole tuber; but without further corroborative experiment I am not prepared to state that such is the fact. There seemed to be no difference in value between the eyes from the different ends of the tuber, the yields being almost the same in C and D and also in E and F.

---

* Some potatoes were stolen from this plot and a very few from C.

VALUE OF ASHES FOR VARIOUS CROPS. It is evident from the results of our experiments with ashes that they are of great value as a fertilizer for all the crops with which they were tried; but we cannot yet state their exact money value. The ashes used in our experiments were in each case spread broadcast upon the land and harrowed in only a short time before planting the seed, and the crops of the past season evidently did not utilize all the plant-food in them. In order that the plant-food contained in ashes may be more fully available for the crop for which they are intended, they should be applied the autumn previous to the planting of crop.

HERRING GUANO. The effect of this fertilizer in all the experiments in which it was used was very marked; and notwithstanding its poor mechanical condition, it being very coarse, its action was quick and sustained. Used in connection with wood-ashes, most excellent results were obtained, the ashes furnishing the element in which the guano is most deficient, viz; potassium. The two should not be mixed before application as the alkalies of the ashes would liberate the ammonia of the guano. Each should be applied separately, and well mixed with the surface soil, in which case no ammonia will be lost.

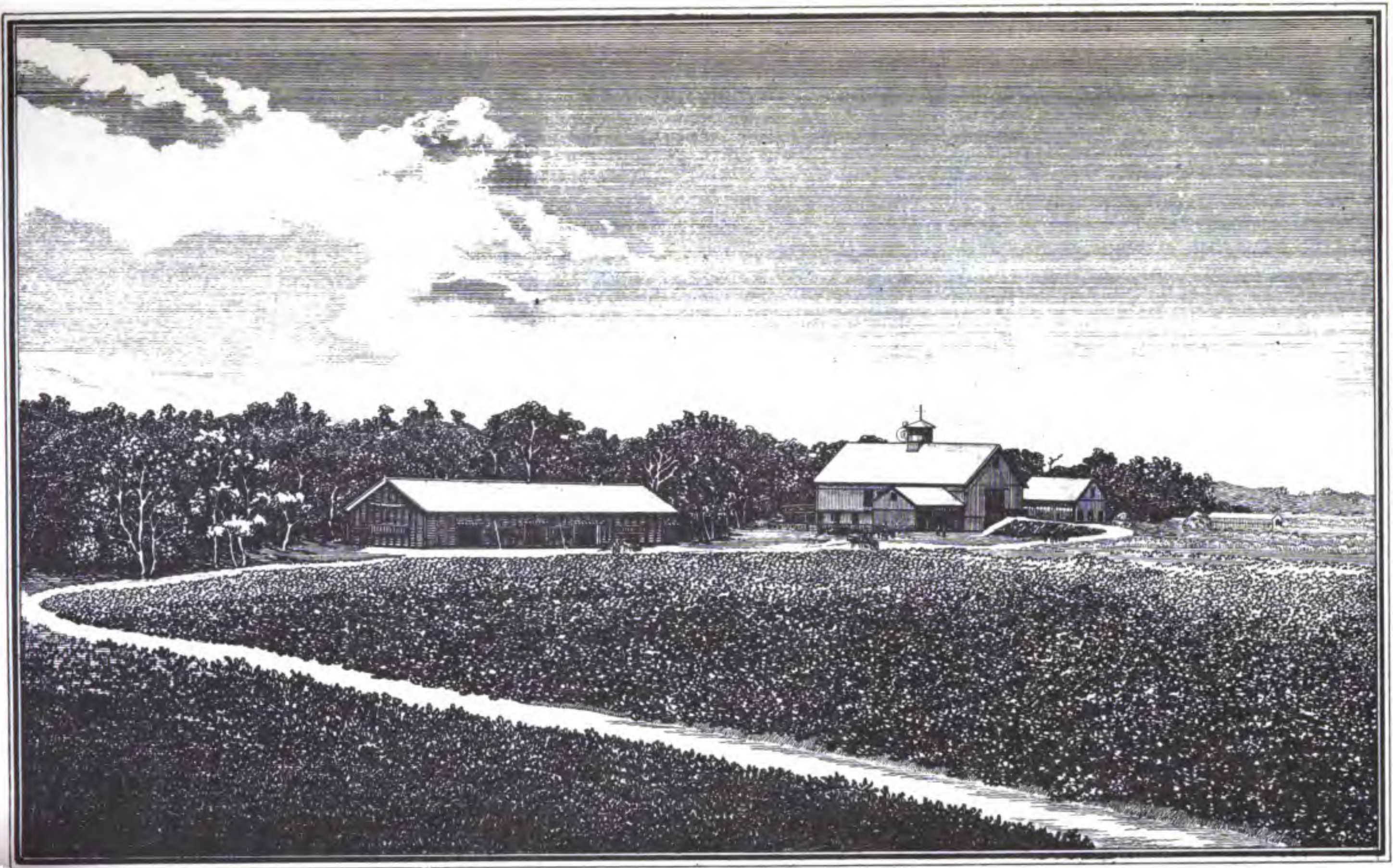
Further experiment is needed to determine the value to the farmers of this fertilizer, the crops to which it is best suited and the best method of application; and such experiments will be made from year to year.

THE ELEMENTS OF PLANT-FOOD MOST SEEDED IN THE SOIL OF THE COLLEGE FARM. The experiments of those students to whom this question was proposed were well and carefully carried out; but the results do not afford data sufficient for the deduction of a definite answer. I will only state that a fertilizer containing nitrogen, phosphoric acid, potash, lime, magnesia and sulphuric acid gave the best crops; and at a fair price for the several ingredients would have given the most profit.

I am well satisfied with the results of this experimental work. It not only gives each student a chance to perform all the operations necessary in the raising of a crop; but fosters a spirit of self-reliance, and shows each the importance of close attention and promptness in the care of crops in such a way as to make more impression than weeks of lecturing upon the subject could do. It also teaches each many important facts in regard to agricultural practice so thoroughly that he will not soon forget them. Though the experiments sometimes fail to give decisive results, failures are often more instructive than successes.

As the plots of the different students are contignous, and as they exchange works, each becomes familiar with the work and results of his classmates; and he derives instruction not from his own experiment alone, but also from those of his neighbors.

◆



COLLEGE FARM BUILDINGS

REPORT

ON THE

COLLEGE FARM.

PROF. W. P. BROOKS, B. S.

PRESIDENT, Wm. Wheeler.
Sir:—

I have the honor to submit my second annual report as Director of the Sapporo Agricultural College Farm.

The general course of farm management outlined in my first report has been followed during the past year. Large crops of various kinds have been cultivated, and the work of improvement prosecuted as fast as the teams and appliances at our disposal would allow. In the execution of work the constant aim has been to do every thing in the cheapest and best manner; but, owing to the fact that the laborers whom I must employ are most of them entirely without previous experience in the use of teams and improved implements and machines, the economical result is not yet what it should be. Because of the inexperience of the workmen there is more breakage of machinery and tools than is at all necessary. Not understanding the use of the several parts of a machine and the relative strain upon each, it is not strange that the ignorant workman meets with many accidents. Time has, however, made a manifest improvement in this respect; and with more stability among the workmen which for the ensuing year I shall endeavor to secure by employing more men by the month, I hope to lessen very much the expenses for repairs.

CROPS CULTIVTED.

The following table shows the amount of land in the various farm crops, the quantity of each produced, and their value at current prices.

	Number of Acres.	Yield.		Value in Yen *
Corn	46 1/2	3066	Bushels, Grain	2151.200
		164	Tons, Stalks	656.000
Grass	30	67	„ Hay	670.000
Potatoes	9	1200	Bushels	360.000
Oats	7 1/2	171.3	„ Grain	85.650
		9	Tons, Fodder	81.000
		8	„ Straw	40.000
Millet	5 1/8	10	„ Fodder	90.000
		1	„ Straw	5.000
		24.8	Bushels, Seed	14.880
Hungarian Grass	3 1/8	5	Tons, Fodder	45.000
		12.6	Bushels, Seed	7.560
		.5	Tons, Straw	2.500
Beans	2	19	Bushels	19.000
		1	Ton, Straw	5.000
Turnips	2.5	1290.5	Bushels	256.525
Sugar Beets and Mangold-Wurzels	2	527	„ Sugar Beets	105.400
		245	„ Mangold-wurzels	49.000
Squashes	.75	9	Tons	90.000
Onions	.33	86.7	Bushels	52.000
Carrots	1.25	195	„	58.500
Cabbages	.75	12	Tons	120.000
Total			Yen	4964.215

Besides the above crops there were small areas in barley, sweet corn, melons, peas, lettuce, radishes, tomatoes, kohl rabi and parsnips, most of the produce of which were sold from the field and will appear in the financial statement as vegetables sold.

The harvested products not included in the above table were valued at yen 100.685, making the total value of harvested products yen 5064.90.

FINANCIAL STATEMENT.

The inventory of farm stock, tools, etc., taken Jan. 1st., 1878, having been destroyed by fire, it is impossible to give in this report a financial statement which

---

* The gold Yen is equivalent to $. 997 U. S. gold.

shall show whether our farming operations for the past year have been profitable or otherwise. I can only make a statement showing the expenses, and the credits for crops raised, products sold and increase and improvement of stock.

FARM EXPENDITURES.

	Yen.
Farm Labor	2805.097
Building expenses	2190.586
Repairs of Implements, Wagons, Machines and Buildings	577.141
Harnesses and Halters and Repairs on Same	554.027
Class Work	122.200
Carpenter's Work	263.945
14 Nambu Cattle and expenses of Transportation	250.273
53 Kokus of Guano and expenses of Transportation	188.538
Squashes	113.754
Corn	125.037
Students' Crops (Corn, Potatoes Turnips and Beets).	130.049
Hay Crops.	99.900
Powder	65.000
Medicines and Transportation of Same	75.447
Stoves and Pipes	23.726
Ashes	15.832
Bags	38.120
Photographs	23.700
Melons	6.000
Translation and Interpreting	3.950
Curry Combs and Brushes	8.350
Sponges and Castile Soap	37.170
Lime	9.000

Bean Poles	9.600
Boiler	5.000
Tar	10.125
Surveying	7.100
Farm Implements	169.936
Beans and Rice Bran	7.850
Transportation of Ayrshire Cattle	22.192
„ of Implements and Seeds	34.169
Sundries	139.175
Seeds	1.599
Total. . . . . .Yen	8131.491

FARM CREDITS.

	Yen.
Harvested Crops as per statement	5064.900
Products sold from Field and Milk sold	436.022
Increase in Value of stock Due to Grass in Pasture	332.500
Total. . . . . .Yen	5833.422

In a complete financial statement, a number of the items included in the table of expenses would appear upon the credit side as increasing the value of farm property. Among these are the building expenses, the cost of corn, squashes, potatoes and other vegetables purchased, the cost of harnesses, implements etc., and the cost of cattle. These items amount to over three thousand five hundred yen, so that the actual expense of raising crops, caring for stock and making many permanent improvements upon the farm has been only about four thousand six hundred yen.

ADDITION TO BARN.

During the year an addition eighty feet long and thirty wide with sixteen feet posts has been built at the west end of the barn upon the north side. Upon the lower floor are pens for breeding swine and sheep, large box stalls for stallion, brood mares, and stock bulls, a slaughter room and a small granary. The slaughter room extends to the plates of the building and is furnished with a boiler used for cooking food for swine, the hog-pens, the sheep-pen and the stalls for horses and bulls open into yards into which the animals can be allowed to run at pleasure.

Under the slaughter room is a root cellar twenty feet long and fifteen wide, one entrance to which is by means of a trap-door outside, where the roots fall upon an inclined slide of strong oak slats which conducts them into the cellar. A stairway leads from this cellar into the passage five feet wide which runs the full length of the building ; and a trap-door in the floor of the slaughter room allows the roots to be raised by means of ropes and pulleys directly into this room where they are then cooked for the swine or cut for the horses, cattle or sheep.

The hay for the bulls and sheep is thrown through trap-doors in the second floor into the passage from which these aminals are fed, the former through sliding doors of oak slats in the front partitions of their stalls, the latter by pitching the hay over the front partition of their pen into racks.

The horses are fed roots or grain through sliding doors similar except in size to those of the bull stalls, while hay is led into their feed boxes through slides a foot square from the floor above. From the bottoms of these slides, the horses pull the hay as they eat it. This device is intended to prevent waste.

The hogs are fed from the passage through doors swinging inward and so contrived that when open the hogs cannot get into their troughs which can therefore be conveniently cleaned, and the food placed in them, when the doors are shut and the hogs gain access to their food. The pens for swine are furnished with a strong oak rail which extends entirely round three sides of each, the trough occupying the other side. These rails are eight inches from the floor and ten from the wall. They are designed to lessen the danger of the killing of the young.

On the second floor of this building is a room twelve feet square, containing a reservoir for water, ten feet square and five deep. The walls of this room are double, the space between being filled with sawdust to prevent the freezing of the water. The water is pumped into this reservoir from the stream of pure spring water which flows near the barn by a wind-mill which is placed upon a tower built on this building. From this reservoir the water is carried in lead pipes to troughs placed in various parts of the barn and shed and also to one in the centre of the barn-yard.

The second floor of the building also furnishes convenient storage room for a large amount of hay or other fodder.

The whole building is very strongly and substantially framed and built, and is a convenient and useful addition to the barn.

FARM STOCK.

The stock owned by the farm consisted Jan. 1st. of the following animals; Nambu horses, 9; Hokkaido horses, 3; Breeding sows, 5; fat hog, 1; pigs, 30; Short-horn cattle:—bulls, 4, milch cows, 4, fat cow, 1, calves, 2; Short-horn high grade cattle:—cows, 4, heifer, 1, calves, 2; Half short-horn, half Japanese:—young bull and heifer calf; Japanese cattle:—working bulls, 3, stags, 11, cows, 3; Ayrshires:—bull, 1, cows, 5, calves, 3.

We have lost two animals by death the past year, one an old working bull from inflammation of the lungs; the other an Ayrshire calf, weak from birth and finally killed, when his bladder was found to be much diseased. I have also to report one abortion among the short-horn cows, the cause of which was obscure, but as there has been only one case in our herd, it is likely to have been the result of an accident, perhaps of a strain got in travelling through swampy places in the pasture as the animal is very heavy.

With these exceptions the general health and condition of the farm stock have been good; but the difference in growth between animals of different blood kept side by side and fed in the same manner has been particularly noticeable. Short-horns at the age of one year are larger than cattle of Japanese blood at two or three, though the expense of feeding the former is not much greater than that of feeding the latter. The first infusion of Short-horn blood makes a wonderful difference. Half bloods are a vast improvement on the native stock, being better for work, better for milk and better for beef.

AYRSHIRES. During the past year I have purchased in America through the agency of Ex-President Clark, six Ayrshire cows and one bull. One of the cows, giving birth to a calf during the ocean voyage, which was exceptionally rough, and probably not receiving proper care, either because of the ignorance or neglect of the men whose business it was to attend to her, died. The calf, however, was saved and it, with the remaining animals, reached here safely in the summer. It could not be expected that after such a long voyage the cows would give the maximum of milk of which they are capable; but they have already proved their marked superiority to any stock previously owned here as milk producers. All seem to be animals of great excellence and Pres. Clark is entitled to much credit for his admirable selection.

The demand for milk has rapidly increased and now exceeds the supply ; and it affords me much gratification to chronicle the fact that several private individuals have already engaged in the business of milk producing. As veal and beef are necessarily produced where milk is produced, these also will slowly find a place in the diet of the people ; and can but exert a favorable influence upon their health and vigor.

FARM CROPS.

The table showing the areas devoted to the several crops and the amounts produced tells, perhaps, about all that is necessary upon this topic ; but a few words about some of the leading crops may not be not of place.

Corn. Corn, as in the preceding year, grew excellently, the average per acre being about sixty-five bushels ; but although sufficiently ripened to keep well in such a climate as that of Massachusetts, it is found necessary in the humid climate of this place to take great precaution against moulding. Corn bins must be narrow and particularly well ventilated. Kiln drying, in my opinion, will prove profitable ; and it will be trid the coming year. The crows are a very serious obstacle to the profitable cultivation of this crop. No more significant illustration of the truth of this statement could be given than the item in farm expenses sixty-five yen for powder. The crows received the full benefit of this ; but, notwithstanding the warm reception given them, they ate many bushels of grain. The reward at present offered for their destruction should be increased sufficiently to make it a reasonably profitable business.

POTATOES. Both the soil and climate seem to be well adapted to this crop. The yields secured are large and the quality all that could be desired. It is the testimony of all the Americans connected with the college that nowhere have they ever eaten potatoes of such fine quality as those of the "Early Rose" variety raised upon the College Farm. The business of raising potatoes for shipping may undoubtedly be made profitable in this vicinity.

MANGOLD-WURZELS. This crop promises to prove one of the best which can be raised here for cattle and sheep. Both the soil and climate favor a luxuriant, healthy growth; and large crops have been produced, the last year, at the rate of thirty tons per acre. The feeding of roots of some sort to animals during winter is strongly to be recommended for the following reasons:—

1.—From the amount of nutriment which they contain and the large quantity which can be produced per acre, roots are one of the cheapest of animal foods.

2.—They exert a very beneficial effect upon the health of animals.

3.—They increase largely the flow of milk.

4.—They enable the animals to more perfectly digest and assimilate dry food such as hay or grain.

Mangold-wurzels keep excellently, and are, therefore, particularly well suited for winter food for animals. They are without the strong flavor of turnips, and impart no disagreeable flavor to milk which the latter are very likely to do.

TURNIPS. The soil and climate seem well suited also to this crop; but the number of insects which prey upon it at all stages of its growth have thus far rendered its successful cultivation difficult. Aphides are very numerous on the leaves when the plants are young, and do much damage. The larvae of one of the Lepidoptera (*Pieris megamera*) prey upon the leaves; and a maggot attacks the roots at about the time they commence to increase rapidly in size.

By planting under circumstances favoring a rapid growth, the plants may be pushed on so fast as to escape serious injury from those insects which attack the leaves; but the maggot proves a very destructive pest against which we, at present, know no effectual remedy. Those plants in which the maggots are found should be pulled up and destroyed either by burning or immersing in hot water. This will serve to prevent the rapid increase of this insect.

The *Pieris megamera*, the larvae of which live upon the leaves of other cruciferous plants also, seeming to prefer the cabbage, produces two or three broods per year. It is, therefore, of especial importance to destroy those which make their appearance early in the season, since a few at this time will, if unmolested, increase sufficiently to do serious injury before the coming of autumn. The perfect insect is a pale yellow butterfly of medium size with black markings on the wings, abdomen and thorax. The caterpillar is of a light green color and when full grown is about an inch and a half in lenghth.

Children may profitably be employed to catch the butterflies in nets with broad mouths at the time the insect is laying its eggs, when it will be seen hovering about the plants. Shingles or thin pieces of board laid among the infested plants will prove useful, for when the caterpillars are ready to pupate many of them will crawl under these shingles, when they can easily be destroyed.

ONIONS. For the first time, as I have been informed, in the history of Sapporo, onions of very best quality were raised upon the College Farm the past year. The crop, although not extraordinarily large, was of more than average size, and some single specimens weighed a pound. The land was well manured—an essential for this crop. The fertilizers used were well rotted barn-yard manure ploughed in to a depth of about fire inches, and herring guano and ashes thoroughly mixed with the surface soil by repeated harrowings.

The crop raised sold quickly at remunerative prices, and the home demand was unsatisfied. There must be an almost unlimited market for this crop in Otaru, Hakodate and Yokohama; and I anticipate that the business of raising onions here for those markets will prove profitable.

SUGAR BEETS. Careful experiments with different fertilizers were made for the purpose of ascertaining their influence upon the quantity and quality of sugar beets produced; but the record of the results was destroyed by fire, so I can give but a very imperfect report from memory.

The fertilizers used were sulphate of magnesia, nitrate of soda, nitrate of potash, chloride of potassium, ashes, herring guano and lime. These were used alone and also compounded in various ways. The difference in both yield and quality was very striking, the yield being the largest where the guano, nitrate of potash, sulphate of magnesia and lime were applied. The amount of sugar in the beets of this plot and of another which was fertilized in a nearly similar way was about five per cent. greater than in any of the others.

The quantity in the best beets was, however, too small to allow a profitable manufacture. The humidity of the climate is evidently unfavorable to the growth of a beet rich in sugar.

But further experiment may lead to the discovery of methods of culture and fertilization which will enable us in part to counteract this.

IMPROVEMENTS.

The two improvements regarded as most necessary are the introduction of English grasses into the pasture, and the thorough under-drainage of portions of the farm. Considerable progress has been made in the former work. Over twenty acres of wild land have been broken up and upon about ten acres a fine crop of potatoes was raised the past summer, the object being to subdue the wild plants. The potatoes raised were of sufficient value to nearly pay for the labor thus far bestowed upon the land; and as they were of an early variety they were harvested in season to allow the sowing of grass seed upon the land in the fall. The old sod having become rotten, the land was put in good condition, and the seed started finely.

No system of thorough drainage being equal to tile drainage, and there being no tiles manufactured in this part of Japan, I decided that it would be best for the farm to manufacture its own tiles. Accordingly a portion of the necessary machinery has been imported from America, and the remainder is being made here according to plans modified from American designs.

A large amount of clay has been drawn to the farm from a pit nearly three miles distant, and the necessary fuel prepared. The manufacture will be commenced at an early day.

A large number of stumps have been extracted, and the area under cultivation thus considerably increased. One hundred and eighty yards of strong post and board fence and two substantial farm gates have been built. Farm roads have been improved and large quantities of gravel put upon one of them. Much gravel has also been drawn for filling up about the farm buildings and considerable work done in grading the land about the same.

SEED RAISING.

The project recommended in my first report of employing some of the farmers in this vicinity to raise seeds for the use of the College Farm, other Government farms and for sale to private individuals has been successfully inaugurated. The last year I have employed men to raise three varities of corn, three of squashes, one of pumpkins and one of melons.

I exercised a general supervision over the work of planting, cultivating and harvesting these crops, and the results were quite satisfactory. I found the farmers very willing to follow my directions and faithful in carrying them out.

Besides proving a good means of obtaining a supply of pure seeds of the different varieties, this method of employing farmers has proved unexpectedly useful in showing them the greater profit possible by raising improved varieties. As an illustration of this fact, I may mention that, while last year I found it difficult to find farmers willing to raise corn, and in the vicinity to which I allude, not half an acre of this crop, besides that raised for the College Farm, was cultivated; the present year, from that one locality, I have already received applications from several farmers who wish to cultivate over twenty acres of corn.

AGRICULTURAL EXHIBITION.

Since it was upon my recommendation that the first exhibition of the Agricultural products of Hokkaido was held, it may uot seem not of place for me to give a brief account of it in this report. The exhibition was held in Sapporo on the fifteenth and sixteenth of October last; and it was an acknowledged success, speaking well both for the skill of the farmers and the fertility of their farms.

The display in the hall included grains and vegetables of all the sorts common in America and many others besides. It also included hemp, flax, silk, wool and articles manufactured therefrom, as well as fruit, hides, leather, harnesses, boots and shoes; oils, syrup from sorghum, flour and meal; canned fish, corn and other vegetables; bread, cake, fancy work, flowers and many other things too numerous to mention. All were tastefully arranged and the hall presented a very attractive appearance.

Out of doors were splendid cattle of the Short-horn, Ayrshire, Devon and native breeds as well as half bloods of notable excellence. There were sheep of the Merino, Lincolnshire and Southdown breeds and Berkshire and Suffolk hogs. There were good horses, and poultry of all kinds. There was also a good display of agricultural tools and implements and of furniture all made in Sapporo.

The drawing and ploughing matches would have been creditable in any country, and the steers trained by students of the Agricultural College it would be difficult to beat.

The interest of the people of the vicinity in the exhibition was great if we may judge from the crowds in attendance; and it can but prove useful in thus bringing the farmers together and showing them the best results of both public and private enterprise. The prizes offered were liberal and will doubtless stimulate the farmers to greater excellence if continued from year to year.

CONCLUSION.

In closing this report, I wish to express my thanks for the hearty support I have received from the officers of the Department in all measures proposed, and also to Officer Yoshida Kiyonori, farm superintendent, for the faithful manner in which he has attended to his duties. To his executive ability that measure of success which the farm has attained is largely due.

SAPPORO AGRICULTURAL COLLEGE.

1878-9.

CATALOGUE OF

OFFICERS AND STUDENTS.

JAPANESE OFFICERS OF ADMINISTRATION.

Dzushio Hirotake, Kaitaku Dai Shiokikwan, *Director.*	Kagoshima.

Mori Genzo, *Warden.*	Niigata.
Shimoyama Yoriyoshi, *Assistant Warden.*	Shidzuoka.
Kato Masatoshi, *Assistant Warden.*	Shidzuoka.
Ikawa Kiyoshi, *Librarian, Foreign Department.*	Shimane.
Nagao Fusan, *Librarian, Chinese and Japanese Department.*	Shidzuoka.
Yoshida Kiyonori, *Farm Overseer.*	Kagoshima.

FACULTY.

William Wheeler, B. S., C. E., America.
President, and Senior Professor of Mathematics and Civil Engineering.
David P. Penhallow, B. S., America.
Professor of Botany and Chemistry.
William P. Brooks, B. S., America.
Professor of Agriculture, and Director of College Farm.
J. Clarence Cutter, B. S., M. D., America.
Professor of Physiology and Comparative Anatomy, and Professor of English Literature.
Cecil H. Peabody, B. S., America.
Junior Professor of Mathematics and Civil Engineering.

Miyasaki Michimasa, Ishikawa.
Instructor in Chemistry.
Ichigo Hiroyoshi, Kanagawa.
Instructor in Mathematics.
Kato Shigeto, Ibaraki.
Second Lient., Japanese Army.
Instructor in Military Tactics.

PREPARATORY DEPARTMENT.

WILLIAM WHEELER, B. S., C. E., *Superintendent.*	America.

IKAWA KIYOSHI, *Instructor in English.*	Shimane.
NAGANO FUZAN, *Instructor in Chinese and Japanese.*	Shidzuoka.
MIYASAKI MICHIMASA, *Instructor in English.*	Ishikawa.
ICHIGO HIROYOSHI, *Instructor in Mathematics.*	Kanagawa.

ACADEMIC STUDENTS.

JUNIORS.

Arakawa Shigehide,	Tokio.
Ideta Seitaro,	Oita.
Ito Hadzutaka,	Tokio.
Kuroiwa Yomonoshin,	Kochi.
Nakashima Shinshi,	Ishikawa.
Ono Kanemoto.	Shidzuoka.
Oshima Masatake,	Kanagawa.
Sato Isami,	Hokkaido.
Sato Shosuki,	Iwate.
Tanouchi Steroku,	Kochi.
Uchida Kiyoshi,	Kochi.
Watase Torajiro,	Shidzuoka.
Yamada Yoshihiro,	Shidzuoka.
Yanagimoto Michiyoshi,	Miye.

Total, ... 14.

SOPHOMORES.

Adachi Mototaro,	Tokio.
Fujita Kusaburo,	Tokio.
Hiroi Isami,	Kochi.
Ito Eitaro,	Chiba.
Ito Kotaro,	Tokio.
Iwasaki Yukichika,	Osaka.
Machimura Kinya,	Ishikawa.
Menjiu Komajiro,	Tokio.
Minami Takajiro,	Nagasaki.
Miyabe Kingo,	Tokio.
Nagai Otohiko,	Shidzuoka.
Ota Inazo,	Tokio.
Sakuma Nobuyasu,	Shidzuoka.
Suwa Shikazo,	Yehime.

Takagi Tamataro,	Hiroshima.
Tsurusaki Kumeichi, *	Nagasaki.
Uchimura Kanzo,	Gunma.
Total,	17

FRESHMEN.

Akakabe Jiro,	Ishikawa.
Dzushio Tsunemori,	Kagoshima.
Harada Shigesada,	Ibaraki.
Hisashima Shigeyoshi,	Tokio.
Hori Soichi,	Kagoshima.
Ibuki Sozo,	Kioto.
Kobayashi Hidetaro,	Hokkaido.
Kojima Kisaku,	Shidzuoka.
Kumanoto Munemasa, †	Kagoshima.
Muto Saburo,	Shiga.
Nakane Toru,	Hokkaido.
Oidzumi Riotaro,	Yamagata.
Otsu Watari,	Miyagi.
Saito Shozaburo,	Niigata.
Sugiyama Kiyotoshi,	Chiba.
Takagi Sukeaya,	Shiga.
Takaoka Naokichi,	Shimane.
Togano Shiokichi,	Niigata.
Total,	18.

---

* Name recently changed from Muraoka to Tsurusaki.

† Private Cadet.

PREPARATORY STUDENTS.

SECOND CLASS. *

Kon Sotosaburo,	Awomori.
Koseki Yoshinobu,	Hokkaido.
Miki Uchu,	Hokkaido.
Nakane Hisashi,	Hokkaido.
Oinouye Arao,	Yehime.
Sase Tatsusaburo,	Awomori.
Utsumi Kadzumitsu,	Tokio.
Yanase Makoto,	Hokkaido.
Yuki Shogo.	Awomori.
Total,	9.

THIRD CLASS.

Ishii Shotaro,	Hokkaido.
Isikawa Kinjiro,	Tokio.
Kanno Susumi,	Hokkaido.
Mizuno Kitaro,	Tokio.
Nakagawa Minosuki,	Hokkaido.
Nakamura Morikadzu,	”
Nakamura Riokichi,	Tokio.
Niida Tadahida,	Shidzuoka.
Okubo Tsurujiro.	Chiba.
Takabatake Yoshikadzu,	Kioto.
Ujiye Kichiroji,	Hokkaido.
Total,	11.

---

* In order to raise the standard of instruction to that contemplated in the regular course of study, there were no promotions from the Second Class at the end of the last academic year.

SUMMARY.

Juniors,	14		
Sophomores,	17		
Freshmen,	18		
TOTAL, ACADEMIC,		49	
Second Preparatory,	9		
Third Preparatory,	11		
TOTAL, PREPARATORY,		20	
GRAND TOTAL			69

PLAN OF ORGANIZATION.

I. OBJECT.

This College was founded by the Colonial Department of the Imperial Japanese Government, with a view to the education of young men for special service in the Department.

The number of Government Cadets is limited to fifty, and all their expenses incurred in the College will be defrayed by the Government.

The general course of instruction will extend over four years, after which successful graduates will serve in the Colonial Department for five years as set forth in the " Agreement of Successful Candidate."

It is the aim of the College to qualify its students for intelligent and effective work in the administration of business, and in those departments of industry and technical science pertaining to agriculture and the development of natural resources, manufactures, and the maintenance of an advanced civilization; also to promote conceptions of their relations to the state and to society, and of self-culture befitting their prospective stations.

The following branches of knowledg are of leading importance in the course of instruction:

1.—Language and Literature,—English; Essays, Elocution and Debate.

2.—Book-keeping and Forms of Business.

3.—Anatomy and Physiology,—Human Anatomy and Physiology, Physical Culture, Zoology, and Veterinary Science.

4.—Mathematics and Engineering,—Algebra, Geometry, Trigonometry, and Surveying; Drawing; Civil Engineering as applied to the construction of Roads, Railroads, Bridges, and to Works for Drainage, Water Supply and Irrigation.

5.—Mechanics, Physics, and Astronomy,—Theoretical and Applied Mechanics; Agricultural Machinery; Heat, light, Electricity; Meteorology; Mechanism of the Solar System.

6.—Chemistry, Geology and Mineralogy,—Theoretical and Practical, with particular reference to Agriculture, Metallurgy, and Chemical Manufactures.

7.—Botany and Horticulture,—Structural, Physiological and Systematic Botany; Microscopy; Practical Horticulture.

8.—Agriculture,—Theoretical and Practical. The various branches named above, to be considered with constant reference to this subject.

9.—Mental Science, Logic, and Political Economy.

10.—Military Science and Tactics.

II. ADMISSION.

For admission to the Freshman Class, candidates must pass a satisfactory examination in the following subjects, viz:—

1.—Japanese and English Languages,—Reading, writing, composition and conversation.

2.—Geography,—Eastern and Western Hemispheres.

3.—Arithmetic,—Elementary, including fractions, denominate numbers, proportion, percentage and its applications, involution and evolution, and analysis.

4.—Universal History,—Elementary.

5.—Algebra,—Through simple equations.

Candidates for admission to an advanced standing will be examined as above, and also in those subjects of study passed over by the class which they may desire to enter.

Candidates must be not less than sixteen years of age, and must furnish satisfactory assurance that they are of sound constitution and good moral character.

Successful candidates must also sign the prescribed form of Contract with the Government, and furnish a satisfactory surety residing either in Tokio or Hokkaido.

Applications for admission should be addressed to the Minister of the Colonial Department, at Tokio, or to the Director of the College at Sapporo. *

Government Cadets will be selected by competition from the whole number of candidates examined therefor.

III. PRIVATE CADETS.

Other candidates who pass a satisfactory examination may enter as Private Cadets without limitation of numbers. †

In the case of Private Cadets the obligation to serve five years under the Government after graduation is dispensed with on condition that they pay the expense incurred on their account, it being provided, however, that in no case shall such charges exceed twelve yen per mouth, each.

In all other respects, Private Cadets are entitled to the same privileges, and subject to the same regulations as are Government Cadets.

---

* During the next academic year, no Freshman class will be formed. Candidates for advanced standing will be received under the prescribed limitations. Two Government cadetships only, are now vacant.

† See the foot-note.

IV. FORMS OF APPLICATION AND AGREEMENTS.

APPLICATION FOR ADMISSION.

I respectfully ask to be received as a (Government Private) Cadet in Sapporo Agricultural Colleg, provided I am able to pass a satisfactory examination.

Signature.................

Date.................

AGREEMENT OF SUCCESSFUL CANDIDATE.

Having been admitted as a Cadet, to the Sapporo Agricultural College, I promise and agree as follows, namely :—

1.—*If I should be expelled from the College on account of any violation of the Laws of the Country or Institution, or if I should be dismissed on account of deficient scholarship, I will pay immediately to the treasurer thereof, the cost of my education from the date of my admission to the time of my expulsion or dismissal, provided however that such charges shall not exceed twelve yen per month.*

2.—*After graduation I will become a citizen of Hokkaido, and will serve in the Colonial Department for five years upon the same terms as other officers of similar rank. I also promise never to petition for a change of my citizenship.*

3.—*I will not offer my resignation as a cadet, or an officer, during the period specified in this agreement, even though sickness or other serious hinderance to my continuance should arise. If I should be compelled by unavoidable circumstances to ask for my discharge, I promise to pay to the treasurer my proportion of the whole expense* *of maintaining the College during my connection with it,—the total amount being divided by the number present with me.—*

Signature................

Date...................

Note. In the case of Private Cadets, paragraphs 2 and 3 are omitted.

AGREEMENT OF SURETY.

As surety for Cadet ...., *if admitted to the Sapporo Agricultural College, I hereby promise and agree to become responsible for his faithful fulfillment of his agreement, with the Colonial Department, and to pay promptly all his indebtedness to the treasurer of the College, in case of his failure so to do.*

Signature................

Date...................

ENDORSEMENT OF PROVINCIAL GOVERNOR.

The accompanying documents are correct, and the within named................ *may be admitted to the College*

Signature................

Date...................

V. EXAMINATIONS AND RANK.

A record of the scholarship and deportment of every student will be permanently kept, and the Rank Lists will be regularly published in the Annual Report.

The professors shall keep a record of the term work of their classes, either daily or as shown by occasional examinations, estimated upon the scale of one hundred for perfect work. At the end of each term final examinations in writing will be held, to aid in determining the advancement of the students, and their relative rank in scholarship.

The average mark of each student in each subject will be determined by combining the mark obtained for term work with that obtained at the final examination, allowing equal weight to each.

The "general average" mark of each student, by which his relative rank will be fixed, will be determined by combining the marks obtaind by him in his several studies, allowing to each a wright proportioned to the average number of exercises therein per week, during the term.

VI. DISMISSION.

If the "general average" mark of any student for any term is less than one-half the maximum, he shall be subject to discharge from the College, and only such as have been regular in attendance and exemplary in conduct will be allowed to go on with their respective classes.

Any student who may be dismissed on account of deficient scholarship, or misconduct, or who may leave voluntarily before the expiration of the time stipulated in his contract, will be required to pay the cost of his education as specified in said contract, up to the date of his leaving. But no payment will be required in behalf of any student who may die, or who may be discharged on account of ill-health, or without fault on his part.

Any student desiring temporary leave of absence on account of the sickness or death of a relative, will be required to present an application from his parent or guardian, accompained by a certificate from a physician and the chief magistrate of the town where the said relative resides.

VII. DIPLOMAS AND CERTIFICATES.

Every student who shall complete the studies of the General Course in a satisfactory manner, will receive a diploma awarding him the degree of Bachelor of Science,—[Gakujiutsu Tokugiyoshi.]

Any worthy student who shall be obliged by circumstances beyoud his control, to relinquish his studies may, by vote of the Faculty and the approval of the Director, receive a certificate of his attainments in any department of study in which he shall have won especial distinction.

VIII. PRIZES.

At the close of each Collegiate year, Prizes to the amount of one hundred and twenty-five yen will be awarded to the most distinguished students in the several classes of the College. The awards will be made by vote of the Faculty, so as to recognize and encourage improvement and excellence in all departments,—it being provided, however, that the sum of the awards made to any one student shall not exceed twenty yen.

IX. ATTENDANCE AND DISCIPLINE.

College exercises will be held every day during term time, except sundays and holidays. Wednesday afternoons will be regarded as time for recreation. Other afternoons will be devoted to field work, military drill, scientific excursions, or as may be ordered by the President with the approval of the Director.

Students must be regular in attendance upon all prescribed duties, and if necessarily absent from any, must apply to the President, or, in case of sickness, to the Professor of Physiology, for a written excuse to be rendered to each officer from whose exercise they shall have been absent.

All cases of discipline, except such as relate to minor offenses subject directly to the control of individual officers, shall be acted upon by the College Faculty, and their decision shall be approved by the Director before the infliction of punishment.

Students must be quiet and orderly in and around the College buildings, and behave everywhere with propriety. Their quarters will be inspected at intervals and strict order and neatness in the care of their rooms, their clothing, and their own persons, will be required.

Physical exercise, being absolutely essential to the preservation of health and mental vigor, is enjoined upon all. In addition to field work, military drills, and excursions required in the course of training, suitable provision will be made for voluntary exercises in gymnastics during the winter season.

Students who may require medical care will be attended by a competent physician from the staff at the Government Hospital. Private Cadets will be charged for medicines only.

X. FACULTY.

The members of the College Faculty shall meet for business at the call of the President, or shall hold stated sessions, as they may deem necessary.

The President shall exercise a general supervision over all the affairs of the College; shall see that the duties of Professors, students and employés are properly assigned and performed; and while consulting freely with the Faculty on questions of discipline and administration, shall have authority to veto their votes, and act according to his own judgment under the approval of the Director, whenever he may deem it necessary for the best interests of the institution.

He shall prepare for publication an annual report upon the work of the College during the preceding year, and state the condition and progress of the several departments. The report shall also be accompanied by such useful papers as may be prepared by members of the Faculty, relating to observations, experiments, and investigations in Agriculture, or any branch of natural science.

Each Professor shall be responsible for the proper instruction and discipline of the classes under his charge, and shall perform such official duties as may be assigned him by the President. He shall also be responsible for the safe-keeping of the books, apparatus, and specimens in his department, and for the economical use of all materials furnished for experimental or practical purposes.

All requests for supplies, repairs, and improvements shall be made to the Director through the President.

XI. GENERAL COURSE OF STUDY AND INSTRUCTION.

FRESHMAN YEAR.

First Term.

Algebra, including Logarithms, 6 hours each week.
Chemical Physics and Inorganic chemistry, 6 hours.

Agriculture, 2 hours.
English and Elocution, 6 hours.
Military Drill, 2 hours.
Manual Labor, 6 hours.

Second Term.

Geometry and Conic Sections, 6 hours each week.
Practical Chemistry, 8 hours.
Agriculture, 4 hours.
English and Elocution, 4 hours.
Free-hand and Geometrical Drawing, 3 hours.
Military Drill, 2 hours.
Manual Labor, 6 hours.

SOPHOMORE YEAR.

First Term.

Agricultural and Quantitative Analytical Chemistry, 8 hours each week.
Botany, 3 hours.
Agriculture, 4 hours.
Human Anatomy and Physiology, 3 hours.
English and Elocution, 4 hours.
Military Drill, 2 hours.
Manual Labor, 6 hours.

Second Term.

Trigonometry and Surveying, 6 hours each week.
Organic Chemistry, first half session, 6 hours.
Spectrum Analysis, second half session, 6 hours.
Botany, 4 hours.
Agriculture, 2 hours.
Mathematical Drawing and Plotting, 3 hours.
Military Drill, 2 hours.
Manual Labor, 3 hours.

JUNIOR YEAR.

First Term.

Astronomy, 3 hours each week.
Topography, 3 hours.
Botany, 3 hours.
Fruit Culture, 3 hours.
Zoology, 6 hours.
English Composition and Elocution, 1 hour.
Topographical Drawing, 3 hours.
Military Drill, 2 hours.
Manual Labor as required.

Second Term.

Mechanics, 6 hours each week.
Agriculture, 3 hours.
History of English Literature, 6 hours.
English Composition and Elocution, 2 hours.
Mechanical Drawing, 3 hours.
Military Drill, 2 hours.
Practical Horticulture, 3 hours.

SENIOR YEAR.

First Term.

Physics, 6 hours each week.
Microscopy, 3 hours.
Geology, 4 hours.
Agriculture, 3 hours.
Mental Science and Logic, 3 hours.
Book-keeping, 4 hours.
Extempore Debate, 2 hours.
Military Drill, 2 hours.
Exercises in Farm Management as directed.

Second Term.

Civil Engineering, 6 hours each week.
Political Economy, 4 hours.
Veterinary Science and Practice, 6 hours.
Original Declamations, 1 hour.
Military Drill, 2 hours.

REMARKS.

The foregoing schedule of exercises is to be followed as nearly as the circumstances of the College will allow.

The manner in which the several branches shall be taught will depend largely upon the ability and preference of the instructor. Oral and practical teaching will be largely pursued, though text-books will usually be employed in connection therewith.

The student will be required to take full notes of lectures and of instruction imparted without a text-book, and to carefully and neatly copy them into a suitable book. The notes will be critically examined and corrected by the teacher.

Recitations, lectures, and laboratory work will usually be in the forenoon, beginning at half past eight o'clock. Drawing, military drill, and manual labor will take place in the afternoon.

XII. LIBRARY AND READING ROOM.

The College Library contains, in the Foreign Department, about 4300 volumes, of which about 3900 are in the English language, and 400 in other Western tongues. In the Japanese and Chinese Department, there are upwards of 1500 volumes.

A list of the additions made since the preparation of the Second Annual Report, will be found elsewhere. Important additions are to be made during the next academic year.

REGULATIONS.

1.—The books in the College Library are intended, primarily, for the use of the officers and students of the College.

2.—The text-books required for the several classes are issued for the term, and they must be returned after the final examinations in the subjects of which they treat.

3.—Text-books excepted, teachers will be allowed to have in their possession, not more than six volumes, and students two volumes each, at one time. They must be returned within four weeks of the date of their issuance in every case. Any book may be once reissued to the same person, for four weeks only; *provided* no application shall have been made for it while in his possession.

4.—Officers of the Colonial Department may take out books upon the same terms as students.

5.—No book shall be taken from the Library without the knowledge and presence of the Librarian, or his representative.

6.—Every book given out must be entered under the name of the taker, in the Librarian's Register, and must be checked off on its return ; the date being noted in both cases.

7.—For books lost or injured, those to whom they shall be then charged, will be held responsible.

8.—Library hours will be from one till two o'clock P. M. daily.

The College Reading Room is maintained by an annual appropriation of seventy-five yen for native and foreign periodicals, and by contributions from the Faculty.

The room is open for the use of officers and students from eight o'clock A. M. to sunset.

XIII. APPARATUS, CABINETS, COLLECTIONS, &c.

The department of Mathematics, Physics, and Engineering is well provided with apparatus and instruments comprising:—

An extensive collection of physical apparatus for the experimental illustration of lectures, and for laboratory practice.

A collection of engineering, mechanical, and agricultural machine models.

Complete furnishings for the drawing-office.

An outfit of surveying and engineering field instruments.

And a small astronomical transit, adapted for triangulation and the determination of latitude and longitude.

The Chemical Laboratory is well furnished throughout with apparatus and supplies for thorough practical instruction in qualitative and quantitative analysis, books in inorganic and organic chemistry. Superior instruments are provided for instruction in spectrology and microscopy. An annual appropriation is made for the maintenance of the Laboratory.

The College Farm and Botanic Gardens are well furnished for the practical instruction of the students in general agriculture and horticulture, and are designed to afford models of good management and taste in rural economy. Liberal appropriations are made annually for their maintenance,—for the purchase of foreign seeds, implements, and machinery, and for the prosecution of experiments and investigations.

The Military department is provided with a suitable drill hall and armory containing, at present, rifles and side arms for a battalion of fifty men.

The College Museum, now in process of formation, comprises mineralogical, geological, botanical and zoological cabinets. The collections are especially designed to illustrate the natural history of Hokkaido, and will include, also, such specimens from abroad as shall be obtained by purchase or exchange.

XIV. CALENDAR.

The Academic Year begins on the fourth Thursday of August, and closes on the first Wednesday of July. It is divided into two terms; the first continuing from the fourth Thursday of August to the fourth Wednesday of December inclusive, and the second from the fourth Thursday of January to the first Wednesday of July.

The Calendar for the next college year is as follows :—

1879-80.

1879.—August 28. First term begins.
August 27,28. Examinations at Sapporo for Admission to Advanced classes *
September 17. Holiday ; Festival of Kanname.
September 23. Holiday ; Shiuki Koreisai.
November 3. Holiday ; Birthday of Emperor.
November 11. Holiday ; Festival of Niiname.

---

* **Applicants living in Tokio and vicinity may be examined at Tokio by an officer of the College, or by some resident foreign teachers duly authorized.**

December 22,23,24. Class Examinations.
December 24. First term ends.
1880.—January 22. Second term begins.
January 30. Holiday; Death of Komei Tenno.
Febuary 11. Holiday; Accession of Jimmu Tenno.
March 21. Holiday; Shiunki Koreisai.
April 3. Holiday; Death of Jimmu Tenno.
June 15. Holiday; Sapporo Festival.
June 29,30, July 1. Class Examinations.
July 1. Second term ends.
August 27. First term, 1880-81, begins.

XV. PREPARATORY DEPARTMENT.

This Department is designed to prepare students for admission to the Sapporo Agricultural College, whose President will superintend the instruction of its classes.

The students will pay a fee of fifty sen per month for the use of books, and for tuition, and will not be provided with board and clothing.

The regular course of study extends over three years.

Applicants for admission should be not less than twelve years of age, and well taught in the elements of Japanese learning. They should also be able to read and write the characters of the Roman alphabet and the Arabic figures, and should understand their simpler combinations.

The scholarship and rank of Preparatory students will be determined as is specified in the case of College students. Whenever, after due trial, it appears that any student is unable to pursue the studies of his class with advantage, he may be transferred to a suitable class, or discharged, at the discretion of the President, with the approval of the Director.

Prizes to the amount of twenty-five yen will be awarded to the most worthy students in the several classes at the close of each academic year.

The Calendar will be the same as that of the College.

XVI. PREPARATORY COURSE OF INSTRUCTION.

FIRT YEAR, THIRD CLASS.

First Term.

English Language, 6 hours each week.
Reading, Spelling and Definitions, 6 hours.
Mental Arithmetic, 6 hours.
Writing, 3 hours.
Japanese and Chinese, 3 hours.

Second Term.

English Language, 6 hours each week.
Reading, Spelling and Definitions, 6 hours.
Mental and Written Arithmetic, 6 hours.
Writing, 3 hours.
Japanese and Chinese, 3 hours.

SECOND YEAR, SECOND CLASS.

First Term.

English Language, 6 hours each week.
Reading, Spelling, Definitions, and Dictation, 6 hours.
Geography, 6 hours.
Writing, 3 hours.
Japanese and Chinese, 3 hours.

Second Term.

English Language, 6 hours each week.
Reading, Spelling, and Analysis, 6 hours.
Geography, 6 hours.
Writing, 3 hours.
Japanese and Chinese, 3 hours.

THIRD YEAR, FIRST CLASS.

First Term.

English Grammar, 6 hours each week.
Practical Arithmetic, 6 hours.
Universal History, 6 hours.
Reading, Composition, and Writing, 3 hours.
Japanese and Chinese, 3 hours.

Second Term.

Arithmetic completed, and Algebra through Simple Equations, 6 hours each week.
History of Civilization, 6 hours.
Reading, Elocution, and Composition, 6 hours.
Japanese and Chinese, 6 hours.

ABSTRACT

OF

FINAL EXAMINATION EXERCISES.

QUESTIONS AND TOPICS FOR WRITTEN EXAMINATIONS.

I. SECOND TERM, 1877-8.

SOPHOMORE CLASS *

CHEMISTRY.

Practical Chemistry.

1.—How are acids classified, and what are the acids of each class?

2.—What characterizes the Chlorates?

3.—Given Acetate of Lead, Chloride of Potassium, and Sodium Nitrate; prove each acid and give chemical changes.

4.—Given Silicate and Biborate of Soda, Sulphate of Baryta, and Arsenite of Soda; prove each acid and state chemical changes.

5.—What acids are similar, in reactions, to Phosphoric acid, and their differnces?

6.—What is the method of converting insoluble into soluble salts, and of separating acids from bases for the determination of the former?

Tims allowed, one hour.

---

* Instruction in Surveying having been temporarily suspended during the absence of Pres. Wheeler, the examination therein was deferred till the succeeding term.

Organic Chemistry.

1.—Organic Chemistry.

2.—Elementary Analysis.

3.—Formulae, state each kind, and its special value, with examples.

4.—State the value of such expressions as $C_n H_{2n+2}$, and how obtained.

5.—Classification of Organic Compounds.

6.—Paraffins.

7.—Olefines.

8.—Alcohols.—Their source, properties, chemical nature, and classification.

9.—Ethyl and Amyl Alcohols.

10.—Fermentation,—Theories respecting, and the probable cause of,—Results of,—Required conditions.

11.—Glucoses.

12.—Polyglucoses,—how formed and distinguished from the glucoses.

13.—Organic Acids. How formed, examples.

Time allowed, two hours.

D. P. Penhallow.

AGRICULTURE.

1.—The Best Season for Sowing Grass-seed, the Selection of varieties to be Sown for Permanent Mowing, and the Manner of Doing the Work.

2.—Principles which should Guide in the Selection of Pasture Land, and the Manner of Converting Forest Land into Pasture.

3.—The Best Place upon the General Farm for a Forest, the Manner of Planting It, and the Kind of Trees to be Planted.

4.—The Location and Quantity of Fences on the General Farm, and the Statement of a Just Law in Regard to Fences between Neighboring Land-owners, and along the Public Roads.
5.—Farm Roads.—Their Importance, and the Manner of Constructing Them.
6.—The Location and Soil most suitable for an Orchard, the Manner of Raising Apple Trees, Transplanting Them, and Their Subsequent Management.
7.—Winter Work on the General Farm.
8.—Manner of Determining What Elements of Plant Food will be in the Excrements from Animals Fed on a Certain Amount of Food, and the Practical Use of Such Knowledge.
9.—The Method of Ascertaining Experimentally, what Elements of Plant Food are Most Wanting in the Soil of a Farm, and the Practical Value of Such Knowledge.
10.—The Routine of Spring Work on a General Farm, and the Proper Time for Planting the Different Crops.

Time allowed, two hours.

W. P. Brooks.

FRESHMAN CLASS.[*]

INORGANIC CHEMISTRY.

1.—Silicon; its distribution, principal forms, and properties.
2.—Carbon; its different forms, properties, and uses.
3.—The different forms of coal, and methods of formation.

---

[*] Owing to the temporary absence of Pres. Wheeler, the examination in Geometry was deferred until the succeeding term.

4.—Combustion; its nature and products, and the required conditions.
5.—State the original theory of combustion, and how disproved.
6.—The flame; its structure, and the principle of the safety lamp.
7.—Give the divisions of the metallic elements, and characteristics of each.
8.—Ammonium.
9.—Arsenic; its properties and how detected.
10.—Iron and its modifications.

Time allowed, two hours.

D. P. Penhallow.

PRACTICAL CHEMISTRY.

1.—Describe the tests used in blow-pipe analysis, and state reasons for the same.
2.—Define the terms Deflagration, and Sublimation, and give examples of each.
3.—Give the reactions of iron, and state how $Fe\ O$ is distinguished from $Fe_2\ O_3$.
4.—Indicate the similarity and difference between lead and bismuth.
5.—Indicate the similarity and difference between antimony and zinc.
6.—Given iron, nickel, and cobalt; prove each.
7.—Given $NH_4\ Cl$, $Sn\ Cl_4$, $Zn\ O$, and $Al_2\ O_3$; prove each.
8.—Given the alkaline earths; prove each.

Time allowed, two hours.

Analysis of two compounds.

Time allowed, eight hours.

D. P. Penhallow.

AGRICULTURE.

1.—The Beneficial Effects of Drainage on Soils.
2.—The Relative Merits of Open, Box, and Tile Drains.
3.—The Manner of Laying Tile Drains.
4.—The Benefits of Irrigation, the Kinds of Water Used, and Their Relative Values for this purpose.
5.—The Method of Making a Water Meadow, where the Surface of the Land is nearly Level, the Water to be Taken from a Stream Flowing through It.
6.—The Construction and Use of a Wing Dam.
7.—The Best Method of Pulverizing Soil, and the Good Points in Swivel and Gang Plows.
8.—The Different Kinds of Harrows, and the Merits of Each.
9.—Superphosphate of Lime.—Its Importance as a Fertilizer, and the Method of Making It.
10.—The Relative Importance of Mineral and Organic Manures.

Time allowed, two hours.

W. P. Brooks.

II. FIRST TERM, 1878-9.

JUNIOR CLASS.

SURVEYING.

Compass and Traverse Surveying.

1.—Describe the Surveyor's chain (Gunter's) and its advantages.
2.—The method of using the chain, or any instrument for the measurement of distance, and the reasons for such practice.

3.—Describe the Surveyor's compass and transit.

4.—Explain the methods of making a compass survey, and of keeping the notes.

5.—How may offsets be made with the chain only?

6.—State different methods of computing areas. Which do you consider the most accurate?

7.—Demonstrate the method of computing areas by the use of "Latitudes" and "Departures," and of "Double meridian distances."

8.—How would you apply this method if only the angles and distances of the traverse were known?

9.—Describe how the area of a field may be determined when the length and bearing of one side are unknown. How may the unknown length and bearing be computed?

Illustrate by solving the following:—

1. N. 29° E. 672 feet.
2. S. 46° E. 425 „
3. S. 71° W. 519 „
4. (Unknown)—

10.—State how you would divide a given area into two or more parts having a given ratio to each other. Illustrate by finding the course and length of a line, passing through station (2) of the traverse given in exersise (10), cutting off one third of the enclosed area next the second side.

11.—How would you make an accurate traverse survey of a field whose corners and boundaries are not easily accessible with the transit and chain.

12.—State the method of computing the area, and of determining the courses and lengths of the sides in the preceding process.

TRIANGULATION.

1.—Base line,—Establishment, measurement, and reduction to sea level.
2.—Define "spherical excess," and state how it may be computed.
3.—Given a triangle on the earth's surface in which the side A B is 98.2765 statute miles; the observation of the angle A, 56° 27′ 15″; B, 68° 03′ 51″; and the angle C, 55° 29′ 35″; to find the true spherical excess, and to make the corrections.
4.—State different methods for computing the sides, and demonstrate.
5.—Interior filling up.

VARIATION OF THE NEEDLE.

1.—Methods of establishing the true meridian.

HARBOR SURVEYING.

1.—Write a comprehensive description of the methods of conducting harbor surveying, the reduction of soundings, and the construction of the map.

RAILROAD CURVES.

1.—How would you lay out a circular curve of any radius, with a chain only, when the center can be seen from every part of the curve? Formula for computing offsets. Example: Radius, 500; Distance between successive stations on the tangent, 50. Required the offset for station (3) of the curve.
2.—To locate with a chain when the center cannot be seen from the curve. Example: $R=600$; $D=100$. Required the offset for station (2) of the curve.

3.—Explain the method of locating curves with the transit, by tangent and chord deflections. Example: Angle of intersection (I), 47°; degrees of curvature per 100 feet (d), 4°. Required the radius of the curve and the distance from the intersection to the tangent points.

4.—Solve the following general problems:

(a).—Given I and T, to find R.

(b).—Given R, to find the tangential deflection, $\frac{d}{2}$.

(c).—Given $\frac{d}{2}$, to find R.

5.—Compound and reverse curves.

LEVELLING.

1.—Given backsight 4.283, at a distance of 420 feet, and foresight 10.785 at a distance of 760 feet. Required the difference of true level,

2.—Explain the vernier.

3.—Given the following notes, to compute the difference of level between the two benches, disregarding curvature and refraction:—

Stations.	Backsights.	Foresights.	Elevations.
Bench.	3.268		87.283
T. P.	1.652	10.879	
T. P.	6.275	11.008	
Bench.		9.151	

4.—Describe the method of conducting profile levelling. Illustrate by an original example covering a distance of 800 feet and give complete notes.

5.—Explain the method of drawing the profile. Illustrate by constructing a profile from your notes under the preceding exercise.

6.—Establish a grade line on the profile you have made in which the cuttings and fillings shall properly balance, and complete the columns of "grade-hights," "cuts," and "fills."

CROSS-SECTION LEVELLING, AND COMPUTATION OF EARTHWORK.

1.—Describe the method of setting Cross-Section stakes, both in cutting and embankment.

2.—Given width of road-bed, 20 feet; ratio of slope $1^{1}/_{2}$ to 1; to complete the following field notes, and to compute the volume of the corresponding prismoid by the prismoidal formula,—the distance between (*a*) and (*b*) being 100 feet:—

Stations.	Left.		Center Cuttings.	Right.	
(a)	$\frac{3.5}{}$	$\frac{5.4}{A}$	7.6	$\frac{8.8}{B}$	$\frac{10.2}{}$
	$\frac{9.5}{}$	$\frac{8.6}{A}$	8.2	$\frac{3.4}{B}$	$\frac{4.2}{}$

TOPOGRAPHY.

1.—Give an outline of the field operations of topographical surveying.

2.—The estableshment of contour lines and the construction of the map.

Time allowed, ten hours, in five exercises of two hours each.

Wm. Wheeler.

ASTRONOMY.

1.—Define azimuth and amplitude; altitude and zenith distance.

2.—Evidences of the spherical form of the earth.

3.—State how the approximate diameter of the earth may be determined, and demonstrate.

4.—The theory of Foucault's pendulum, and its phenomena at different latitudes.

5.—The equinoctial, and celestial meridians.

6.—Define co-ordinates, and state what co-ordinates are referred to the equator, to the horizon, and to the equinoctial respectirely.

7.—The ecliptic; the equinoxes and solstices.

8.—Observations of right ascension and declination.

9.—By what methods may terrestrial longitude be determined?

10.—Two methods for the determination of terrestrial latitude.

11.—State the laws of planetary motion in elliptical orbits.

12.—Equation of time and its causes.

13.—*Problem*: Given the sidereal year of the earth, 365.26 days; synodic revolution of Jupiter, 399 days. Required the sidereal year of Jupiter.

14.—Demonstrate methods for determining the relative distances of inferior and superior planets from the sun.

15.—Solar parallax,—how determined from transits of Venus.

16.—*Problem*: Given mean radius of the earth 3956 miles; mean apparent radius of the sun $16' \, 1''$; solar parallax $8.6''$; mean density of the earth 5.5; gravity at the surface of the earth 16.1 feet. Required (*a*), diameter of the sun; (*b*), distance of the sun; (*c*), mass of the sun, that of the earth being unity; (*d*), gravity at the surface of the sun; (*e*), density of the sun.

Time allowed, five hours.

Wm. Wheeler.

FRUIT CULTURE.

1.—Name the Different Parts of Trees, and State the Functions of Leaves.
2.—Production of New Varieties by Crossing.
3.—Propagation of Varieties.
4.—Soil and Situation Best for an Orchard.
5.—The Method of Pruning young Trees to Insure Their Assuming a Desired Form.
6.—The Curculio.—Its Habits and the Best Means of Preventing its Ravages.
7.—Root-Grafting Apple Trees.
8.—The Causes which Predispose the Peach Tree to Injury from Cold.
9.—Propagation of Grapes. Describe the Method most Practiced.
10.—The Pruning and Training of the Grape Vine.

Time allowed, two hours.

W. P. Brooks.

ZOOLOGY.

1.—Give the general characteristics of the Vertebrata.
2.—Define Viviparous, Oviparous, and Ovoviviparous generation, and give examples under each.
3.—Blood.—Composition; appearance; variations in temperature; color; corpuscles.
4.—Give in full the characteristics in Fishes.
5.—Describe metamorphosis in the Frog.
6.—Digestive organs, and digestion in Birds.
7.—Give the general characteristics of Mammals.
8.—Artificial pisciculture,—its methods and results.
9.—Describe in full metamorphosis in Insects.
10.—Name the sub-orders (Packard) of Insects, with the names of three injurious insects under each.

Time allowed, two hours.

J. C. Cutter.

SOPHOMORE CLASS.

GEOMETRY.

1.—The sum of the three perpendiculars drawn from any point within an equilateral triangle to its sides, is equal to the altitude of the triangle.

2.—The area of an equilateral triangle is 100 square inches. Required the radius of the circumscribed circle.

3.—If a secant line terminating in the concave arc of the circumference of a circle, be taken as a diameter, the perpendicular drawn from the middle point of its external segment to its circumference will be equal to a tangent drawn from that point to the given circle.

4.—Given the radius of three circles, to describe them so that they will be tangent, each to the other two, externally.

5.—The sides of a regular hexagon being 1, required the sides of a rectangle that shall exactly inclose it, and the ratio of their respective areas.

6.—The lengths of two parallel chords on the same side of the center being given, and their distance apart, to determine the radius of the circle.

7.—From the greater end of a trapezoidal field whose parallel ends and breadth measure 792,524 and 693 feet respectively, it is required to cut off an area of 200,000 square feet, by a fence parallel to the parallel ends of the field. Required the length of the fence, and its distance from the greater side.

8.—There are three circles whose radii are a, b, and c feet respectively. Required the radius of a fourth whose area is equal to the sum of the other three.

9.—The diameters of the lower and upper bases of the frustum of a cone, and its altitude are in the ratio of 5, 4, and 3, respectively. The volume of the cone of which the frustum is a part is 1000. Required the volume of the frustum, and the altitude of the cone.

10.—The capacity of a cylinder is a cubic feet, and its convex surface b square feet. Required the dimensions of the cylinder.

11.—At what distance from the surface of a sphere may one-third of its surface be seen?

12.—If a heavy sphere whose diameter is 4 inches, be placed in a conical glass full of water whose diameter is 5, and altitude 6 inches, how much water will remain in the glass?

Eight exercises only to be performed, no two consecutive ones to be omitted.

Time allowed, two hours.

Wm. Wheeler.

PRACTICAL CHEMISTRY.

1.—Give the general grouping of elements for analytical purposes, and state the principle of such arrangement.

2.—Give the changes which will occur when the following compounds are brought together in solution, viz; $Fe_2 Cl_6 + 2 K_2 SO_4 + Ba (NO_3)_2 + 6 NH_4 HO$. What, if any, will be rendered insoluble?

3.—Given $As_2 O_5 + Sb_2 S_3 + Hg Cl$; separate and prove each acid and base.

4.—Given $Fe_2 Cl_6 + Mg HPO_4 + Fe SO_4$; separate and prove each acid and base.

5.—Given $Ba (NO_3)_2 + K Cl O_3 + (NH_4)_2 C_2 O_4$; separate and prove each.

6.—Given $Cu SO_4, 5 H_2 O$; determine the three constituents, base, acid, and water, quantitatively, and state proportions required. Also give the formulae of the various reactions.

Time allowed, one and one-half hours.

Compound of nine acids and bases for analysis.

D. P. Penhallow.

BOTANY.

1.—The parts of a plant, and their functions.
2.—The leaf.
3.—The flower, and its morphological nature.
4.—Functions of the various floral organs.
5.—Modifications of organs, and consolidation.
6.—Phyllotaxy, and how determined.
7.—Ovules; where produced, and their morphological nature.
8.—Parts of the ovules, and their kinds.
9.—Germination.
10.—Endogenous stem.
11.—Exogenous stem.
12.—Parts of exogenous stem, and their functions.

Time allowed, two hours.

D. P. Penhallow.

AGRICULTURE.

1.—Muck,—Its Chemical and Physical Characteristics, and Soil Adaptation.
2.—The Value of Animal Excrements as Affected by the Food, Age, and Condition of the Animal.
3.—The Nitrogen of the Atmosphere, and Its Relations to Vegetable Nutrition.
4.—The Economy of the Use of Brains in Farm Management.

5.—General Farming,—Its Advantages and Disadvantages as an Occupation.
6.—Location and Selection of a General Farm.
7.—Division of the General Farm into Mowing, Tillage, etc.
8.—Points Which Should Be Secured in the Construction of a Barn for General Purposes.
9.—Timothy and Red Clover,—the characteristics and Adaptation of Each.
10.—The Manner of Sowing Grass Seed with Grain.

Time allowed, two hours.

W. P. Brooks.

PHYSIOLOGY.

1.—Bones,—composition,—medulla,—membranes,—and uses.
2.—Given a piece of bread and meat in the mouth,—follow its course, giving the changes it undergoes, till it enters the blood.
3.—Lungs,—size,—form,—color,—position, etc., and functions.
4.—Heart and blood-vessels,—their anatomy and functions.
5.—What reasons can you give to account for the circulation of the blood ?
6.—What precautions must you observe for the preservation of health ?
7.—What is fecundation ?—how effected in mankind ?
8.—Give the treatment of a wound of an artery, as of the arm.
9.—Treatment to restore natural breathing, as in a drowning case.
10.—Constipation,—its effects, and hygienic treatment.

Time allowed, two hours.

J. C. Cutter.

ENGLISH.

1.—Propriety in Composition,—Its Importance. Give an Example of a Sentence Containing Words Improperly Used.

2.—Periodic Sentences,—Their Merits and Demerits.

3.—Importance of Observing a Certain Order of Words in English Sentences.

4.—The Proper Position of Adverbs, and Adverbial Clauses and Adjuncts.

5.—Correct the following sentence, and state the reasons for the Corrections made :—Me ascended up the hill bearing the dead body of the deceased, while a band of martial military music which were playing a tuneful melodious tune, composed of a fife, drums and trumpets, followed behind him.

Composition on either of the two following subjects:—

(*a*).—The Changes Wrought During the Last Twelve years in Japan.

(*b*).—Fishes and Fishing in Japan.

Time allowed, two hours.

W. P. Brooks.

FRESHMAN CLASS.

ALGEBRA.

1.—Multiply $x^m + x^{m-1}y + x^{m-2}y^2 + y^m$ *by* $x - y$.

2.—Find two factors for $x^3 - y^3$.

3.—What sum of money put at simple interest will amount to $ 1488 in 8 months, and $ 1530 in 15 months ?

4.—Divide 27 into two parts which shall have to each other the ratio of 4 to 5.

5.—Simplify $(a^{-\frac{1}{4}} a^{\frac{1}{3}})^{\frac{3}{4}}$.
6.—Divide $1+\sqrt{-1}$ *by* $1-\sqrt{-1}$.
7.—Given $x^8-2x^4=8$, to find the value of x.
8.—Two cubic blocks of stone, placed one upon the other, form a column 8 feet high, containing 152 cubic feet. What are the lengths of their edges respectively?
9.—What number is that which exceeds the square of its fourth part, by the fourth part of itself?
10.—The length of a room containing 36 square yards, exceeds its breadth by 5 yards. Required the length and breadth of the room.
11.—Given $\sqrt{x}+6=\sqrt{12+x}$, to find the value of x.
12.—Find a factor to rationalize $\sqrt{8}-\sqrt{1}-\sqrt{3}$.
13.—Required the square root of $3+2\sqrt{2}$.
Time allowed, two hours.

Wm. Wheeler.
Ichigo Hiroyoshi.

CHEMISTRY.

1.—Gravity.
2.—Specific gravity, and how determined.
3.—Metric System.
4.—Molecular Forces.
5.—Heat, and how measured.
6.—Light,—its source and propagation.
7.—Relation of light to heat.
8.—Disposition of light.
9.—Electricity.
10.—Relation of Physical forces to Chemistry.
11.—Laws of chemical combinations.
12.—Classification of elements.
13.—Chemical nomenclature.

14.—Hydrogen.
15.—Metals of the alkalies.

Time allowed, two hours.
D.P.Penhallow.

AGRICULTURE.

1.—The Influence of Agriculture on National Prosperity.
2.—The Importance of a Knowledge of Entomology and Veterinary Medicine to the Farmer.
3.—What is Soil, and What Classes of Matter Does It Contain.
4.—The Agencies Which Have Been, and Are Instrumental in Breaking up Rocks. Describe the Mode of Action of Any One of Them.
5.—Influence of Organic Matter upon the Mineral Constituents of Soils.
6.—The Products Resulting from the Decay of Vegetation with Full access of Air.
7.—The Form in Which Plants Take Their Mineral Food.
8.—Importance of a Variety of Elements in an Agricultural Soil.
9.—The Manner of Formation of Alluvial Soils, and Their Chemical and Physical Characteristics.
10.—What is Sub-soil, and What Are the Differences Commonly Found between It and Surface Soil?

Time allowed, two hours.
W. P. Brooks.

ENGLISH.

1.—Nouns,—definitions; kinds,—definition of each, with examples.

2.—Adverbs,—definitions; kinds,—examples under each.
3.—Write a sentence with a relative clause. Point out the antecedent.
4.—Punctuation,—definition; the various signs and their use.
5.—What is a sentence; kinds, and examples.
6.—Define synonyms. Give two under each of the following:—Vice, Love, Youth, Battle.
7.—What is tautology? How may it be avoided?
8.—Correct the following sentence:—"The Anshunt Egyptians used too use myerh, spices & nitre For embarming the ded boddies off the disceased."
9.—What is essential for a good letter? What is to be avoided?
10.—Address a letter to a friend in Liverpool.

Time allowed, two hours.

J. C. Cutter.

RANK LISTS
SECOND TERM 1877—8.

SOPHOMORE CLASS.

NAME.	RANK.	DEPORTMENT.	GENERAL AVERAGE.	SURVEYING. Weight, 2½.	CHEMISTRY. Weight, 5.	AGRICULTURE. Weight, 2.	CHINESE. Weight, 2.
Arakawa Shigehide.	1	100	90.9	90	91.2	91.6	90.7
Sato Shosuke.	2	100	90.7	75	96.5	96.4	90.0
Ono Kanemoto.	3	100	89.8	93	89.8	84.8	91.0
Oshima Masatake.	4	100	86.4	82	89.6	91.5	79.0
Watase Torajiro.	5	100	84.6	85	81.0	87.2	90.5
Kuroiwa Yomonoshin.	6	100	84.0	95	79.4	88.5	77.5
Sato Isami.	7	100	83.3	76	83.4	91.2	81.5
Ideta Seitaro.	8	100	82.3	78	83.9	86.1	86.5
Uchida Kiyoshi.	9	100	78.2	86	77.0	91.4	58.5
Tanouchi Steroku.	10	100	75.9	83	76.7	85.4	55.5
Nakashima Shinshi.	11	100	73.6	75	66.0	74.6	90.0
Ito Kadzutaka.	12	100	72.1	68	68.9	84.3	73.0
Yamada Yoshihiro.	13	100	69.7	68	64.5	76.3	78.0
Yanagimoto Michiyoshi.	14	100	67.0	63	66.0	74.6	67.7

FRESHMAN CLASS.

NAME.	RANK.	DEPORTMENT.	GENERAL AVERAGE.	GEOMETRY. Weight, $2^1/_2$.	CHEMISTRY. Weight, 8.	AGRICULTURE. Weight, 4.	DRAWING. Weight, 1.	ENGLISH. Weight, 2.
Uchimura Kanzo.	1	100	92.0	93	93.8	93.9	70	84.6
Takagi Tamataro.	2	100	88.7	80	95.9	87.4	74	80.3
Miyabe Kingo.	3	100	86.4	95	84.8	90.7	78	78.0
Menjiu Komajiro.	4	100	82.8	90	83.2	81.1	73	70.7
Ota Inazo.	5	100	81.3	73	79.7	88.2	73	88.0
Fujita Kusaburo.	6	100	79.8	86	80.6	84.1	70	64.8
Adachi Mototaro.	7	100	78.8	76	79.4	85.2	80	66.8
Iwasaki Yukichika.	8	100	75.9	72	73.0	81.7	72	82.6
Minami Takajiro.	9	100	75.8	85	73.8	82.8	79	56.6
Sakuma Nobuyasu.	10	100	70.5	68	64.8	82.5	65	74.8
Hiroi Isami.	11	100	70.1	80	63.0	81.1	71	63.4
Ito Eitaro.	12	100	67.9	65	63.9	79.2	75	61.3
Suwa Shikazo.	13	100	61.7	65	56.9	65.5	74	63.4
Ito Kotaro.	14	100	60.5	81	50.3	67.4	60	61.8
Machimura Kinya.	15	100	57.9	62	47.8	71.8	60	64.2
Nagai Otohiko.	16	100	54.2	35	52.3	65.5	77	57.0
Tsurusaki Kumeichi.	17	100	52.6	25	51.4	68.1	72	51.1

FIRST TERM,* 1878—9

JUNIOR CLASS.

NAME.	RANK.	DEPORT-MENT.	GENERAL AVERAGE.	ASTRO-NOMY. Weight, 3.	SURVEY-ING. Weight, 2.	FRUIT CUL-TURES. Weight, 3.	ZOOLOGY. Weight, 3.	DRAWING. Weight, 2.	ENGLISH. Weight, 2.
Arakawa Shigehide.	1	100	89.1	92.0	91	84.3	90.4	85	92.3
Kuroiwa Yomonoshin.	2	100	89.1	91.5	93	82.0	84.0	99	90.1
Oshima Masatake.	3	100	87.0	89.0	94	84.7	90.6	75	86.7
Ono Kanemoto.	4	100	86.6	88.0	93	82.9	80.4	90	89.2
Uchida Kiyoshi.	5	100	86.5	80.0	78	89.9	91.4	86	93.1
Sato Shosuke.	6	100	84.8	88.0	76	92.9	80.8	80	88.3
Ito Hadzutaka.	7	100	84.7	79.0	89	84.7	87.1	80	90.3
Sato Isami.	8	100	84.1	84.0	76	85.2	90.6	75	90.2
Tanouchi Steroku.	9	100	82.6	80.0	70	83.6	79.9	95	89.2
Watase Torajiro.	10	100	81.8	71.5	75	85.5	87.5	80	91.8
Yanagimoto Michiyoshi.	11	97	78.6	73.0	71	85.8	82.5	72	84.6
Ideta Seitaro.	12	100	78.5	77.0	70	85.2	80.7	65	89.6
Nakashima Shinshi.	13	100	75.8	73.0	65	74.0	80.7	78	84.2
Yamada Yoshihiro.	14	100	68.7	53.5	56	74.0	74.8	70	85.6

---

* Military instruction, having been given during three weeks only of the term, is not considered in making up the rank lists for this term.

SOPHOMORE CLASS.

NAME.	RANK.	DEPORTMENT.	GENERAL AVERAGE.	GEOMETRY. Weight, 2.	BOTANY. Weight, 3.	CHEMISTRY. Weight, 4.	AGRICULTURE. Weight, 4.	PHYSIOLOGY. Weight, 3.	ENGLISH. Weight, 2.
Uchimura Kanzo.	1	100	94.0	98.0	95.5	98.3	89.6	98.4	81.1
Miyabe Kingo.	2	100	87.4	83.0	93.0	89.4	89.5	82.8	81.8
Ota Inazo.	3	100	85.2	85.0	86.1	76.8	92.0	85.5	87.2
Takagi Tamataro.	4	100	84.3	56.5	83.4	89.8	88.2	85.4	74.8
Sakuma Nobuyasu.	5	100	79.8	84.0	60.4	61.7	89.7	90.0	80.8
Minami Takajiro.	6	100	78.4	85.0	86.3	70.9	78.1	83.4	67.7
Fujita Kusaburo.	7	100	78.2	97.0	69.4	78.4	83.1	73.8	69.0
Ito Eitaro.	8	100	77.8	72.5	75.8	84.0	79.7	82.3	63.5
Hiroi Isami.	9	100	77.7	84.0	70.3	76.7	83.7	79.7	69.3
Adachi Mototaro.	10	100	77.3	82.0	77.1	77.3	78.4	79.0	68.4
Iwasaki Yukichika.	11	100	72.1	58.0	79.6	52.8	82.2	79.2	82.4
Menjiu Komajiro.	12	99	70.4	80.0	65.0	66.5	71.8	73.3	69.8
Ito Kotaro.	13	100	62.9	65.0	63.6	57.5	61.7	69.8	63.0
Nagai Otohiko.	14	100	61.4	49.0	60.7	65.9	64.4	59.3	63.2
Suwa Shikazo.	15	100	61.4	67.5	46.3	54.3	74.6	65.0	60.0
Machimura Kinya.	16	100	61.1	56.5	42.4	61.4	72.8	63.3	66.2
Tsurusaki Kumeichi.	17	100	60.3	64.0	37.8	59.7	65.6	76.6	56.2

FRESHMAN CLASS.

NAME.	RANK.	DEPORTMENT.	GENERAL AVERAGE.	ALGEBRA. Weight, 6.	CHEMISTRY. Weight, 6.	AGRICULTURE. Weight, 2.	ENGLISH. Weight, 6.
Kobayashi Hidetaro.	1	100	91.8	97.0	84.5	92.0	93.8
Tagano Shiokichi.	2	98	88.3	100.0	78.3	91.7	85.6
Otsu Watari.	3	97	86.0	98.5	77.8	92.1	79.7
Kojima Kisaku.	4	100	84.0	70.0	85.2	94.1	93.3
Saito Shozaburo.	5	99	82.2	87.0	65.2	91.1	91.3
Akakabe Jiro.	6	99	81.8	84.0	78.1	86.7	81.7
Harada Shigesada.	7	100	80.8	81.0	65.3	90.3	93.0
Nakane Toru.	8	100	79.9	89.0	64.7	82.7	84.9
Ibuki Sozo.	9	100	78.4	87.0	67.8	74.6	81.7
Hisashima Shigeyoshi.	10	100	73.9	81.0	57.5	80.6	80.9
Oidzumi Riotaro.	11	100	72.2	87.0	43.7	80.6	83.2
Sugiyama Kiyotoshi.	12	100	72.0	86.0	48.2	81.5	78.7
Takaoka Naokichi.	13	98	71.4	57.5	59.9	90.3	90.4
Hori Soichi.	14	100	70.0	67.0	52.6	76.0	88.3
Dzushio Tsunenori.	15	99	61.5	77.0	23.4	61.7	84.1
Takagi Sukeaya.	16	100	58.5	70.0	25.5	46.5	84.1
Muto Isaburo.	17	98	53.9	49.0	31.4	56.6	80.3
Kumamoto Munemasa.	18	100	34.4	6.0	13.8	68.0	72.3

AWARD OF KAITAKUSHI PRIZES.

FOR THE YEAR ENDING JULY 3rd 1878.

The prizes established for the formal "recognition and encouragement of excellence and improvement in all departments" of the College, were awarded as follows :—

SOPHOMORE CLASS.

Mathematics :	First,	Kuroiwa Yomonoshin,	$ 7,00
	Second,	Arakawa Shigehide,	„ 3,50
Chemistry :	First,	Sato Shosuke,	„ 7,00
	Second,	Oshima Masatake,	„ 3,50
Agriculture :	First,	Sato Shosuke,	„ 7,00
	Second,	Arakawa Shigehide,	„ 3,50
Drawing :	First,	Ono Kanemoto, Tanouchi Steroku.	„ 7,00
	Second,	Arakawa Shigehide,	„ 3.50
Chinese :	First,	Ono Kanemoto,	„ 7.00
	Second,	Arakawa Shigehide,	„ 3,50

FRESHMAN CLASS.

Mathematics :	First,	Uchimura Kanzo,	$ 7,00
	Second,	Miyabe Kingo,	„ 3,50
Chemistry :	First,	Takagi Tamataro,	„ 7,00
	Second,	Menjiu Komajiro,	„ 3,50
Agriculture :	First,	Uchimura Kanzo,	„ 7,00
	Second,	Miyabe Kingo,	„ 3,50
Drawing :	First,	Adachi Mototaro,	„ 7,00
	Second,	Minami Takajiro,	„ 3,50
English :	First,	Ota Inazo,	„ 7,00
	Second,	Uchimura Kanzo,	„ 3,50
Chinese :	First,	Iwaki Yukichika,	„ 7,00
	Second,	Nagai Otohiko,	„ 3,50

But for the provision limiting to twenty dollars, the amount in prizes to be awarded to any student, Mr. Uchimura would have been entitled to the second prize in the department of Chemistry.

PREPARATORY DEPARTMENT.

First Class:....	First prize to Kojima Kisaku,..	$ 3,00
	Second, to Nakane Toru, ...	„ 2,00
Second Class:..	First, Yanase Makoto, ...	„ 2,50
	Second, Yuki Shogo,........	„ 1,50
Third Class : ..	First, Kanno Susumi,........	„ 2,00
	Second, Ishikawa Kinjiro,....	„ 1,00

SPECIAL PRIZES.

The Special Prizes offered by Prof. D. P. Penhallow for collections in Natural History made during the past two years, have been awarded by him as follows :—

For the best Zoological collection, exclusive of insects,—Milne Edwards' *Zoology*,—awarded to Yanagimoto Michiyoshi.

For the best collection of Insects,—Packard's *Guide to the Study of Insects*,—awarded to Tanouchi Steroku.

For the best collection of Plants,—Henfrey's *Botany*,—awarded of Watse Torajiro.

For the best collection of Menerals,—Dana's *Manual of Geology*, —awarded to Sato Shosuki.

Messrs. Uchida Kiyoshi and Tanouchi Steroku are deemed worthy of honorable mention for the excellence of their Botanical collections.

LIST OF BOOKS

ADDED TO THE LIBRARY.

1878-9.

ACTON, E.,	Modern Cookery.
Agassiz, L., and A. A. Gould,	Principles of Zoology.
Alden, J.,	Christian Ethics.
Appleton, D. & Co. Pub.,	American Cyclopaedia, vols. 1-3, 12-16.
” ”	Annual Cyclopaedia, 1861-76.
Argyll, Duke of,	Reign of Law.
Armengand, Amouroux, and Johnson,	The Practical Draughtsman.
Armstrong, Mrs. M. F., and H. W. Ludlow,	Hampton and its Students.
Arnold, M.,	Higher Schools and Universities in Germany.
Atkinson, E.,	Ganot's Physics, 6 copies.
Audubon, Mrs.,	Life of Audubon.
BAIRD, C. W.,	Discourses and Essays of D'Aubigné.
Ball, R.,	Radau's Wonders of Acoustics.
Banker's Daughter, A,	First Lesson in Business.
Barnes, A.,	Evidences of Christianity.
Beard, G. M.,	Eating and Drinking.
” ”	Stimulants and Narcotics.
Beecher, C.,	Autobiography and Correspondence of L. Beecher, 2 vols.
Bennett, C. H.,	Aesop's Fables.
Berker,	Cooking.

Berners, J.,	First Lesson in Health.
Berriman, M. W.,	Militia-man's Manual.
Bevan, G. P.,	British Manufacturing Industries, 3 vols.
„ „	Industrial Classes and Statistics, 2 vols.
Bracket, A. C.,	Education of American Girls.
Bremer, F.,	Homes of the New World, 2 vols.
Brewster, D.,	Life of Newton.
„ „	Martyrs of Science.
Brown, T.,	Philosophy of the Human Mind, 2 vols.
„ „	Taxidermist's Manual.
„ W.,	Curse of Rum.
Browne, J. R.,	Land of Thor, 2 copies.
Bunker, T.,	The Tim Bunker Papers.
Burke, E.,	On the Sublime and Beautiful.
Burr, F.,	Field and Garden Vegetables of America.
CALDWELL, G. C.,	Agricultural Chemical Analysis.
Carpenter, W. B.,	Vegetable Physiology.
Catlin, G.,	Last Rambles among Indians of the Rocky mountains and the Andes.
Chadbourne, P. A.,	Instinct in Animals and Men.
„ „	Lectures on Natural Theology.
Chalmers, T.,	Bridgewater Treatises.
Cheever, G. B.,	The Hill Difficulty and some Allegories.
Chubb, G. H.,	Protection from Fire and Thieves.
Church, A. H.,	Laboratory Guide.
Clark, W. S.,	Scheerer's Blowpipe Manual.
Clarke, L. L.,	Objects for the Microscope.

Clater, F.,	Cattle Doctor.
Coffin, C. C.,	Four years of Fighting.
Combe, G.,	Constitution of Man.
Constantin,	Flachen-skelete Der Farnkrauter.
Cooke, J. P.,	The New Chemistry.
Coppee, H.,	Grant and his Campaigns.
Cornelius, Mrs.,	Young House-keeper's Friend.
Creasy, E. S.,	Fifteen Decisive Battles of the World.
Cummings,	Memoir of Rev. E. Payson.
Curtis, G. W.,	The Potiphar Papers.
Dana, J. D.,	Manual of Geology.
Darwin, C.,	Animals and Plants under Domestication, 2 vols.
” ”	Insectivorous Plants.
D'Aubigné J. H. M.,	History of the Reformation, Vol. 4.
Dawson, J. W.,	Story of the Earth and Man.
Dickens, C.,	Oliver Twist.
” ”	Pickwick Papers.
Downing, A. J.,	Landscape Gardening and Rural Architecture, 17 copies.
Dresser, H. E.,	United States Tariff and Internal Revenue Law.
Du Chaillu, P. B.,	Adventures in Equatorial Africa.
Eassie, W.,	Sanitary Arrangements for Dwellings.
Eastwood, B.,	Cranberry Culture.
Edwards, M.,	Manual of Zoology.
Eggleston, E.,	Circuit Rider.
” G. C.,	How to Educate Yourself.
” ”	How to Make a Living.
Ellis, W.,	Three Visits to Madagascar.

Embury, E. C.,	American Wild Flowers.
Emerson, R. W.,	Representative Men.
Everett, E.,	Practical Education and Useful Knowledge.
FARADAY, M.,	Lectures on the Physical Forces.
Fawcett, H.,	Manual of Political Economy.
Fearn, D. R.,	School Inspection.
Flammarion, C.,	The Atmosphere.
Fleming, G.,	Manual of Veterinary Sanitary Science and Police.
Flint, C. L.,	Grasses and Forage Plants.
Foster, M.,	Text Book of Physiology.
Fowler, W. W.,	Ten Years in Wall Street.
French, H. F.,	Farm Drainage.
„ J. D. W.,	Ayrshire Record, Vol. 1.
Fuller, A. S.,	Forest Tree Culturist.
„ „	Grape Culturist.
„ „	Small Fruit Culturist.
Fulton, J. A.,	Peach Culture.
GARRET, P., & Co., Pub.,	Speaker's Garland, 3 vols., 2 copies.
Gifford, S. N., and G. A. Marden,	Manual for the General Court of Massachusetts.
Gilson, A.,	The Czar and the Sultan.
Gladstone, J. H.,	Michael Faraday.
Goodrich, S. G,	Johnson's Natural History, 2 vols.
Goodspeed, E. J.	History of Great Fires in Chicago and the West.
Gough, J. B.,	Autobiography and Personal Recollections.
Gray, A.,	New Lessons and Manual of Botany, 20 copies.

Gray, A.,	Structural and Systematic Botany.
Greene, A.,	After Night.
„ „	Happy Days at Hampton.
Guillemin, A.,	Wonders of the Moon.
HALL, C. F.,	Arctic Researches and Life Among the Esquimaux.
„ N.,	Autobiography of J. V. Hall.
Hamilton, G.,	Country Living and Country Thinking.
Harper & Bros., Pub.,	Circumnavigation of the Globe.
„ „ „	Memoirs of Benjamin Franklin.
Harris, J.,	On the Pig.
Haven, J.,	Mental Philosophy, 12 copies.
Headley, J. S.,	Mountain Adventures.
„ „	Napoleon and his Marshals.
„ „	Washington and his Generals.
Henderson, P.,	Gardening for Pleasure.
„ „	Gardening for Profit.
„ „	Practical Floriculture.
Herschel, J. F. W.,	The Admiralty Manual of Scientific Enquiry.
Hickok, L. P.,	Rational Cosmology.
Hitchcock, E.,	Geology of the Globe.
„ „	Religion of Geology.
„ „	Reminiscences of Amherst College.
„ R. D.,	Analysis of the Bible.
Hooker, W. J.,	Synopsis Filicum.
Hoopes, J.,	The Book of Evergeen.
Hoppin, J. M.,	Life of Admiral Foot.
Hug, M.,	Travels in the Chinese Empire, 2 vols.
Hullah, J.,	The Speaking Voice.
Hunt, R.,	The Poetry of Science.

Huxley, T. H.,	Practical Biology.
Jacques, D. H.,	Physical Perfection.
Jay, W.,	Prayers for the Use of Families.
Jenkins, E.,	The Devil's Chain.
Johnson, A. J., Pub.,	Family Altas.
„ „ „	New Univeral Cyclopedia, 4 vols.
Johnson, S. W.,	How Crops Feed, 16 copies.
Jones, T. R.,	Outline of the Animal Kingdom.
Judd Co.,	Orange, American Agriculturist, 1877.
KENDRICK, A. C.,	Life and Letters of E. C. Judson.
Kern, G. M.,	Practical Landscape Gardening.
Krummacher, F. W.,	The Suffering Saviour.
LANGHORNE, J. & W.,	Plutarch's Lives.
Lawrence, W. R.,	Diary and Correspondence of A. Lawrence.
Layard, A. H.,	Discoveries at Nineveh.
Letheby, H.,	Food.
Livingstone, D.,	Expedition to the Zambesi.
„ „	Travels and Researches in South Africa.
Lloyd & Co., Pub.,	Battle History of the Great Rebellion.
Loomis, E.,	Treatise on Meteorology.
Loving, G. B.,	Farm Yard Club of Jotham.
London, J. C.,	The Villa Gardener.
Lubbock, J.,	British Wild Flowers in relation to Insects.
„ „	Origin and Metamorphoses of Insects.
MACLAREN, A.,	Physical Education.

Malcolm, H. F.,	India and the Indian Mutiny.
Mallet, R. & J. W.,	Earthquake Catalogue.
Mann, H.,	Lectures and Reports on Education.
Mantell, G. A.,	Wonders of Geology, 2 vols.
Marion, F.,	Wonders of Optics.
„ „	Wonders of Vegetation.
Marsh, G. P.,	Origin and History of the English Language.
„ „	The Earth as Modified by Human Action.
Martin, E. W.,	Behind the Scenes in Washington.
Mathews, W.,	Getting on in the World.
Maury, M. F.,	Physical Geography of the Sea.
Maximowiez,	Primitiae Florae Amurensis.
Mayhew, H.,	The Wonders of Science.
Mc Cabe, J. D.,	Cross and Crown.
Melvill, H.,	Bible Thoughts.
Menault, E.,	Intelligence of Animals.
Miles, W.,	On the Horse's Foot.
Mitchell, D. G.,	My Farm at Edgewood.
Mivart, G.,	The Common Frog.
Montagn, B.,	Works of Lord Bacon, 3 vols.
Moody, D. L.,	Glad Tidings.
„ „	Great Joy.
„ „	To All People.
Moore, A.,	Notes from Beecher's Discourses.
„ G.,	Body and Mind.
„ „	The Soul and the Body.
Morse, E. S.,	Early Stages of an Ascidian. Pamphlet.
„ „	Embryology of Terebratulina. Pamphlet.

Morse, E. S,	Health matters in Japan: Pamphlet.
„ „	Systematic Position of the Brachiopoda. Pamphlet.
Motley, J. L.,	Rise of the Dutch Republic, 3 vols.
Murphy, A.,	Works of S. Johnson, 2 vols.
Murray, H.,	Encyclopedia of All Nations.
„ W. H. H.,	The Perfect Horse.
Nason, E., & T. Russell,	Life of Henry Wilson.
Neander, A.,	Life of Christ.
Newman, J. B.,	Beauties of Flora.
Nicholson, H. A.,	Ancient Life History of the Earth.
„ „	Zoology, 17 Copies.
Nordhoff, C.,	California.
Orton, J.,	Comparative Zoology.
„ „	The Andes and the Amazon.
Packard, A. S.,	Guide to the Study of Insects, 9 copies.
Paxton,	Botanical Dictionary.
Peabody, S. H.,	Elements of Astronomy, 16 copies.
Peirce, B. K.,	Bible Scholar's Manual.
Perry, A. L.,	Elements of Political Economy, 16 copies.
Phin, J.,	How to Use the Microscope, 16 copies.
Phipson, T. L.,	De Fouvielle's Thunder and Lightning.
Porter, J. A.,	Principles of Chemistry.
„ N.,	American Colleges and the American Public.
„ „	Books and Reading.
Potter, A.,	Pleasures of Science.

Potter, A.,	The School and the School-Master.
Pouchet, F. A.,	The Universe.
Prime, S. S.,	Under the Trees.
Pritzel, G. A.,	Iconum Botanicarum Index.
Proctor, R. A.,	New Star Atlas.
QUINBY, M.,	Bee Keeping.
RALSTON, W. R. S.,	Russian Folk-Tales.
Randall, H. S.,	Practical Shepherd.
Randolph, Pub.,	Popular Objections, etc.
„ S. N.,	Domestic Life of Thomas Jefferson.
Rankine, W. J. M.,	Civil Engineering, 10 copies.
Ran, C.,	Early Man of Europe.
Raymond, R. W.,	Mineral Resources of the Rocky Mountains.
Reclus, E.,	The Earth.
„ „	The Ocean.
Robinson, S.,	Facts for Farmers and Family Circles.
Rolfe, W. J., & J. A. Gillet,	Hand-book of the Stars.
Rolleston, G.,	Forms of Animal Life.
Rowell & Co.	The Men Who Advertise, 1870.
SACHS, J.,	Text Book of Botany.
Samuels, E. A.,	Birds of New England.
Schaufler, W. G.,	Meditations on the Last Days of Christ.
Scott, H. L.,	Military Dictionary.
Shaw, T. B.,	English Literature, 10 copies.
Sherman, W. T.,	Memoirs, 2 vols.
Sidney, E.,	Life of Rowland Hill.
Smee, A.,	My Garden,—Its Plan and Culture.
Smiles, S.,	Character.
„ „	The Huguenots.

Smiles, S.,	Thrift.
Smith, A.,	The Wealth of Nations.
„ R. S.,	Topographical Drawing, 16 copies.
Southey, R.,	Life of Wesley, 2 vols.
Springer, J. S.,	Forest Life and Forest Trees.
Stanley, H. M.,	How I found Livingstone.
Stewart, F. F.,	Sorghum and its Products.
„ H.,	Irrigation for the Farm, Garden and Orchard.
Stockhardt, J. A.,	Principles of Chemistry.
Stonehenge,	British Rural Sports.
Swan, J. G.,	Three years Residence in Washington Territory.
Talfourd, T. N.,	Works of Charles Lamb, 2 vols.
Talmage, T. De W.,	Sports that Kill.
Taylor, G. E.,	Notes on Collecting and Preserving Natural History Objects.
Taylor, W. M.,	David, King of Israel.
» »	Elijah, the Prophet.
» »	Peter, the Apostle.
Tenney, S.,	Geology, 16 copies.
Thackery, W.,	Novels and Lectures.
Thomas, J. J.,	American Fruit Culturist, 17 copies.
» »	Rural affairs, 7 vols.
Thompson, J. P.,	Memoirs of Stoddard.
Thomson, W. M.,	The Land and the Book, 2 vols.
Thunberg, G. A.,	Flora Japonica.
Titcomb, J.,	Letters to Young People.
Tract Society, Pub.,	Holy Bible.
Tyler, W. S.,	Commemorative of Samuel Williston.
» » »	Memoir of Lobdell.
Tylor, E. B.,	Early History of Mankind.

Tylor, E. B.,	Primitive Culture, 2 vols.
Tyndall, J.,	Heat as a Mode of Motion.
UNITED STATES	House of Representatives' Memorial Addresses on the Life and Character of Thaddeus Stevens.
Upham, T. C.,	Interior or Hidden Life.
„ „	Madame Guyon and Fenelon, 2 vols.
Vaux,	Villa and Cottage.
VERNE, J.,	Michael Strogoff, the Courier of the Czar.
Vincent, H.,	History of Camp-Meeting and Grounds at Martha's Vineyard.
WALLER, H.,	Last Journals of Livingstone.
Warren, S.,	Diary of a Physician, 3 vols.
Watson, A.,	American Home Garden.
Wells, W.,	Water Power of Maine.
Wheeler, G.,	Homes for the People.
„ J. B.,	Civil Engineering, 16 copies.
Whitney, W. D.,	Language and Study of Language.
Will, H.,	Tables for Qualitative Chemical Analysis, 16 copies.
Willard, X. A.,	Practical Dairy Husbandry.
Willmot, R. A.,	Poets of the Nineteenth Century.
Winchell, A.,	Doctrine of Evolution.
„ „	Sketches of Creation.
Wood, A.,	Botanist and Florist.
Woolsey, T. D.,	Divorce and Divorce Legislation.
„ „	First Century of the Republic.
„ „	Political Science.
„ „	Religion of the Present and of the Future.

Wooster, D.,	Alpine Plants, 2 vols.
Wright, L.,	The Practical Poultry Keeper.
Youtt, W.,	On Cattle.
" "	On Sheep.
" "	On the Horse
" " & Wartin,	On the Hog.
Zurcher, & Magolle,	Meteors.

REPORTS.

Boston, City of,	Report of School Committee, 1876.
Maine, State of,	State Board of Agriculture, 1875-6
Massachusetts, State of,	State Board of Agriculture, 1853-78. 26 vols.
" "	Thirtieth Annual Report of Board of Education.
" "	State Board of Health, 1870-77.
" "	Board of Commissioners Relating to Taxation, 1875.
" "	Journal of the House of Representatives, 1867.
" "	Industry of Massachusetts, 1865.
Michigan, State of,	State Board of Agriculture, 1870.
New Hampshire State of,	State Board of Agriculture, 1875.
New york, State of,	Transactions of the State Agricultural Soceity, 1871.
United States,	Department of Agriculture, 1866-72, 1874-76, 10 vols.

United States,	Report of Commissioner of Education, 1873.
„ „	Patent Office Report, 1851, '53,—2 copies; '54, '57, 5 vols.
„ „	Ninth Census, 1870.
„ „	President's Message and Documents, 1875, 2 vols.
„ „	Report of Bureau of Statistics, 1876.
„ „	Commercial Relations with Foreign Countries, 1876.
„ „	Digest of Opinions and Leading Cases on International Law.
Vermont, State of,	State Board of Agriculture, 1877.

LIST OF LIBRARY BOOKS.

DESTROYED BY FIRE, JAN. 25th., 1879.

Clark, W. S.,	Scheerer's Blowpipe Analysis.
Dana, J. D.,	Mineralogy.
Eggleston, E.,	Circuit Rider.
Fowne, G.,	Elements of Chemistry.
Gray, A.,	Lessons in Botany.
Green, J. R.,	History of the English People.
Guizot, F. P. G.,	History of Civilization.
Hepburn, J. C.,	Japanese and English Dictionary Abridged.
Hughes, W.,	Manual of Geography.
Matsumoto, R.,	English and Japanese Conversation.
Maximowiez,	Primitiae Florae Amurensis.

Mitchell, S. A.,	School Geography.
Parker and Watson,	Third Reader.
Paxton,	Botanical Dictionary.
Philips, G. & Son, Pub.,	Comprehensive Atlas.
Sargent, C.,	First Reader.
Thomson, W. M.,	The Land and the Book, 1 vol.
Tomlinson, C.,	Cyclopedia of Useful Arts, 1 vol.
Ure, A.,	Dictionary of Arts, Manufactures and Mines, 2 vols.
Watt, H.,	Dictionary of Chemistry, 6 vols.
Will, H.,	Tables for Qualitative Chemical Analysis.
Willson, M.,	First reader—Mental Arithmetic.

READING ROOM FILES.

DAILY.

NAME.	WHERE PUBLISHED.	DONOR.
New York Tribune, (incomplete file.)	New York, U. S.,	Wm. Wheeler.
Springfield Republican,	Springfield, Mass., U. S.,	D. P. Penhallow.
Tokio Nichi-Nichi Shimbun, (Tokio Daily News),	Tokio, Japan,	College Fund.
Yubin Hochi Shimbun, (Mail Informer),	,, ,,	,, ,,
Hakodate Shimbun, (Hakodate News), issued alternate days,	Hakodate, Japan,	,, ,,

WEEKLY.

NAME.	WHERE PUBLISHED.	DONOR.
Boston Journal,	Boston, U. S.,	W. P. Brooks.
Commonwealth,	,, ,,	Wm. Wheeler.
Cultivator and Country Gentleman,	Albany, N. Y., U. S.,	W. P. Brooks.
Harper's Weekly,	New York, U. S.,	,, ,,
Illustrated Christian Weekly,	,, ,,	W. S. Clark.
Massachusetts Ploughman,	Boston, U. S.,	W. P. Brooks.
Nation,	New York, U. S.,	College Fund.
Nature,	London, England.,	,, ,,
New York Tribune,	New York, U. S.,	W. P. Brooks.
Patent Office Gazette,	Washington U. S.,	College Fund.
Portsmouth Weekly,	Portsmouth, N. H.,	D. P. Penhallow.
Scientific American,	New York, U. S.,	College Fund.
Scientific American Supplement,	,, ,,	,, ,,
Shichi-Ichi Zappo, (Weekly Messenger),	Kobe, Japan.	,, ,,

MONTHLY.

NAME.	WHERE PUBLISHED.	DONOR.
American Agriculturist,	New York, U. S.,	W. P. Brooks.
American Journal of Microscophy,	,, ,,	D. P. Penhallow.

American Journal of Science and Arts,	New Haven, U. S.,	College Fund.
American Naturalist,	Philadelphia, U. S.,	D. P. Penhallow.
Boston Journal of Chemistry,	Boston, U. S.,	College Fund.
Gardener's Monthly and Horticulturist,	Phila., U. S.,	,, ,,
Harper's New Monthly Magazine,	New York, U. S.,	W. P. Brooks.
Scientific Farmer, (2 copies),	Boston, U. S.,	Publishers. College Fund.
Scribner's Monthly,	New York, U. S.,	Wm. Wheeler.
Sapporo No Gakko Hokoku Sho, (Sapporo Ag'l College Bulletin),	Sapporo,	College Fund.
Van Nostrand's Engineering Magazine,	New York, U. S.,	,, ,,

QUARTERLY.

Bulletin of the Nattall Ornithological Club,	Mass., U. S.,	College Fund.

PRESENTED.

By Dr. J. W. Rohrbeck of New York, U. S. A.,
A Mason and Hamlin Organ.

SUMMARY

OF

METEOROLOGICAL OBSERVATIONS,

FOR THE YEAR 1878

BY

W$_{m}$. WHEELER, AND N. FUKUSI.

ASIA LIBRARY
S
539
.J3
H74
1976
v.3a